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Purpose: CERCLA Site Inspection

Site: Stauffer Chemical Company
AKA: ICI Americas
1415 S. 47th Street
Richmond, California
Contra Costa County

Site EPA ID Number: CAD009123456

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Date of Inspections: June 9, 1992
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1.0 Introduction

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the U.S. Environmental Protection Agency (EPA) has tasked URS Consultants, Inc (URS) to conduct a Site Inspection (SI) of the Stauffer Chemical Company (Stauffer) site in Richmond, Contra Costa County, California

The Stauffer site located at 1415 South 47th Street in Richmond, California (EPA ID# CAD009123456) was identified as a potential hazardous waste site by EPA and entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database on November 1, 1979 The site again came to EPA's attention through a Region IX industry-based site discovery project conducted in 1990-1991 under the name ICI Americas located at 1200 South 47th Street in Richmond, California (EPA ID# CAD080709553) EPA's site discovery project identified several key facilities for assessment, including agricultural chemical formulators, manufacturers, and applicators. A Preliminary Assessment (PA) regarding the site was produced in May of 1987 by ICF Consulting Associates, Inc. After reviewing the PA, EPA decided that further investigation of Stauffer site would be necessary to more completely evaluate the site using EPA's Hazard Ranking System (HRS) criteria. The HRS assesses the relative threat associated with the actual or potential releases of hazardous substances from the site The HRS is the primary method of determining a site's eligibility for placement on EPA's National Priorities List (NPL). The NPL identifies sites at which EPA may conduct remedial response actions. This SI report is the result of URS' recent investigation

Both 1200 and 1415 South 47th Street are located within the property boundary of the Stauffer site (1906 to 1986) which has been operated by Imperial Chemical Industries Americas, Inc. (ICI Americas) since 1990. This SI investigation was conducted under the Stauffer name (EPA ID# CAD009123456) for both the 1200 and 1415 South 47th Street properties. Activities conducted at both addresses by past and current operators are addressed in this report. For CERCLA purposes, the property located at 1200 South 47th Street has been combined with the 1415 South 47th Street property as the Stauffer site (9).

1.1 Apparent Problem

Since 1906, hazardous materials have been used, stored, and disposed of at the Stauffer site. There are six areas of concern at the Stauffer site: the cinder landfill, former sedimentation ponds, evaporation ponds, surge ponds, the storm water discharges, and hazardous wastes stored on-site. Contaminants attributable to site operations have been detected in sediments collected from nearby surface water bodies that are used by sensitive species and for recreation and fishing. Analytical results of soil samples collected during the 1992 URS sampling event from the cinder landfill and former sedimentation pond area revealed levels of arsenic, cadmium, copper, mercury, zinc, alpha-hexachlorocyclohexane (a-BHC), beta-hexachlorocyclohexane (b-BHC), gamma-hexachlorocyclohexane (Lindane), Aldrin, aldrin epoxide (Dieldrin), p,p-dichlorodiphenyl dichloroethlyene (DDE), dichlorodiphenyl dichloroethane (DDD), 4,4-dichlorodiphenyl trichloroethane (DDT), Endrin aldehyde, alpha-octachloro-4,7-methanotetrahydroindane (alpha-Chlordane), gamma-octachloro-4,7-methanotetrahydroindane (gamma-Chlordane), and Arochlor-1248 [a polychlorinated biphenyl (PCB)] at greater than three times background concentrations. Analysis of sediments collected by URS in 1992 from tidal marsh areas revealed levels of arsenic, cadmium, copper, lead, mercury, zinc, a-BHC, b-BHC, delta-hexachlorocyclohexane (d-BHC), Lindane, Aldrin, Dieldrin, DDE, DDD, DDT, Endrin, Endrin ketone, Endrin aldehyde, alpha-Chlordane, gamma-Chlordane, toxaphene, and Arochlor-1248 at greater than three times background concentrations. The correlation of contaminants detected in on-site waste management sources and sediment samples from the adjacent tidal marsh indicate that contaminants have migrated to surface water bodies from sources at the Stauffer site (5,6,19,27).

Several National Pollutant Discharge Elimination System (NPDES) permit violations have been documented and have resulted in the suspension of those permits. Several fish kills have occurred in San Francisco Bay near the Stauffer site, including one incident in 1960 that resulted in a fine which Stauffer paid to the California Department of Fish and Game (5,33,46,47).

2.0 Site Description

2.1 Site Location

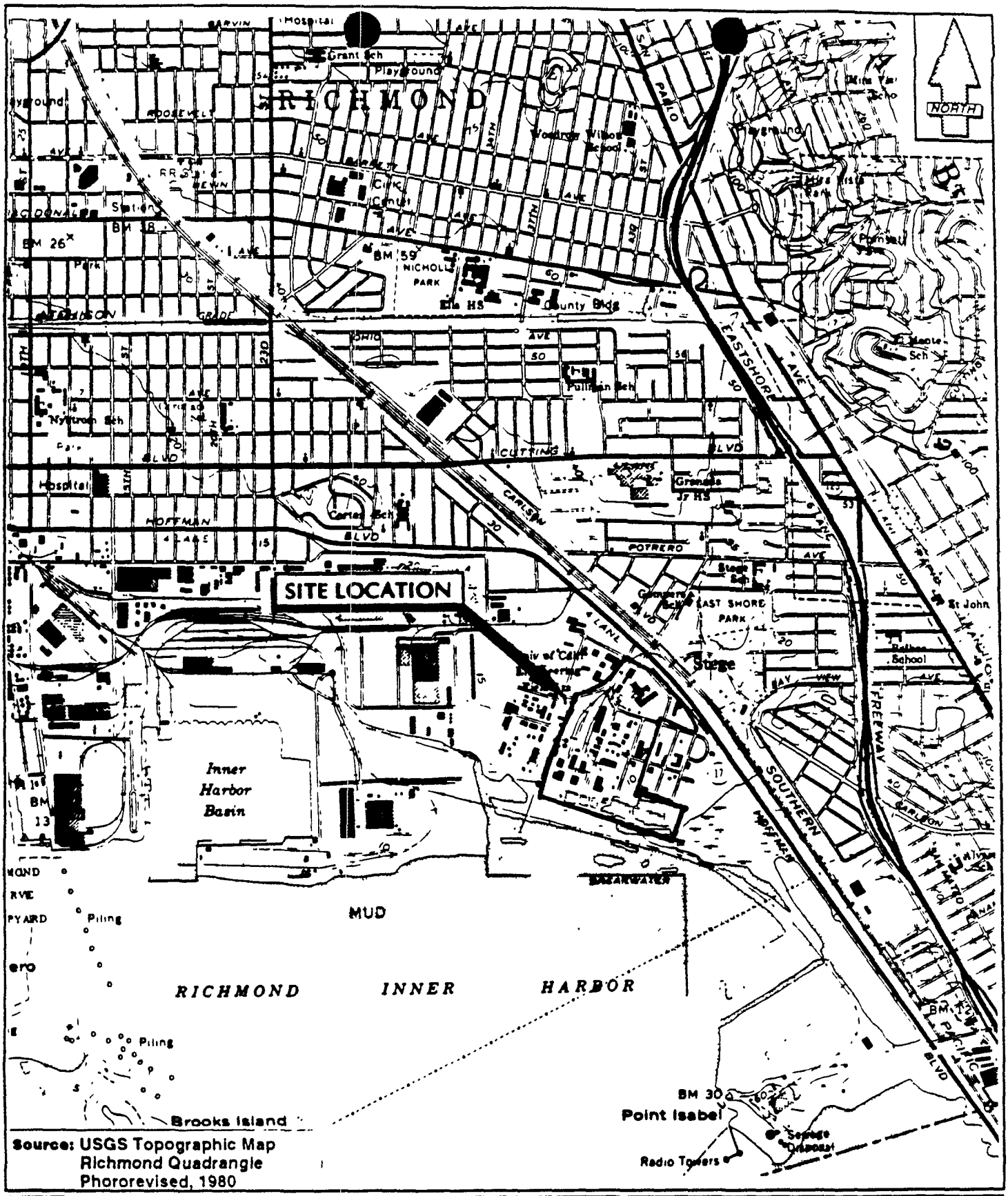
The Stauffer site (currently owned by ICI Americas) is located in the southern portion of the city of Richmond, Contra Costa County, California. The Stauffer site is bordered to the north and east by Meade Street, to the south by an unnamed tidal marsh, and to the west by 46th Street (see Figure 2-1, Site Location Map). The geographic coordinates of the Stauffer site are 37° 54' 45 0" North latitude and 122° 19' 47 0" West longitude, Township 1 North, Range 5 West, Mount Diablo baseline and meridian The area surrounding the Stauffer site is primarily industrial, along with commercial and residential areas (1).

2.2 Site Description

Stauffer operated the 75-acre site between 1906 and 1985 The site is relatively flat and contains tank complexes, office buildings, railroad spurs, maintenance buildings, warehouses, research laboratories, wastewater treatment ponds, a cinder landfill, and a greenhouse (see Figure 2-2, Facility Map) Site operations include manufacturing, formulating, bulk loading, and distributing of agricultural chemicals and research (2,9,10,13,19).

A wastewater treatment and disposal system is located in the southern portion of the site The wastewater treatment system currently consists of five surge ponds with a total capacity of 4 million gallons, a neutralization system, a carbon filtration system, and two evaporation ponds. This wastewater system is designed to minimize the risk of releasing untreated wastewater to San Francisco Bay. Directly south of the site is an unnamed tidal marsh and San Francisco Bay (2,9).

Directly east of the evaporation ponds is the Blair Southern Pacific Landfill (Blair) (EPA ID# CAD980496889). In 1971 Stauffer used the landfill for disposal of 6,200 tons of waste containing chromium, lead, asbestos, and undetermined salts associated with agricultural products. Blair is not located on the Stauffer property; however, the only documented disposal at Blair was the disposal of waste materials generated by Stauffer As of 1980 the landfill was still "open," although it is not known if wastes were still being accepted. The current ownership of the Blair site is unknown; however, discussions with the Contra Costa County Assessors office indicate that the Blair site is owned either by ICI Americas or the State of California (16,52).



Source: USGS Topographic Map
Richmond Quadrangle
Photorevised, 1980

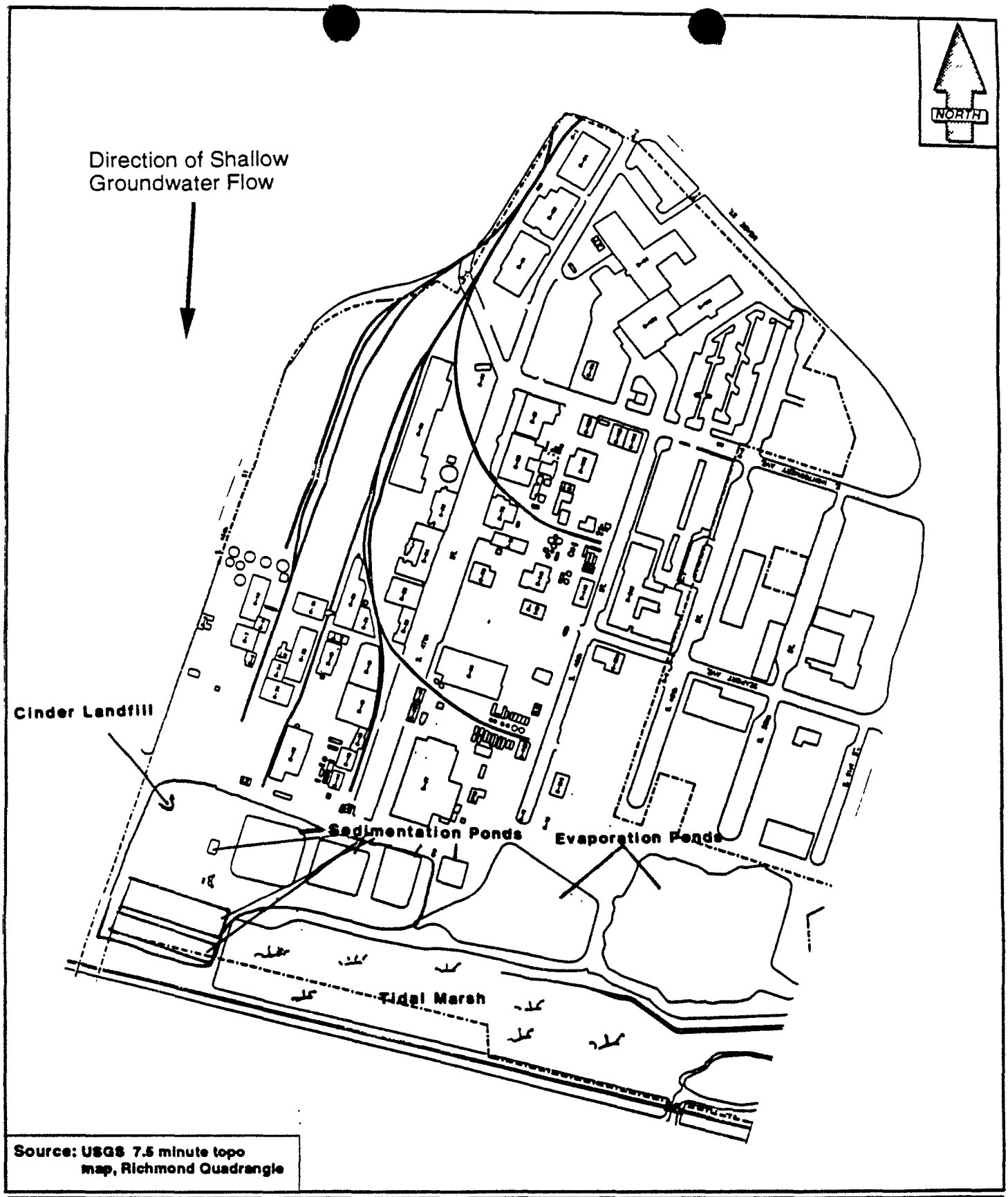
URS Consultants
100 California Street
San Francisco, CA 94111
August 10, 1992

Site Location Map

Stauffer Chemical Company
(ICI Americas)
Richmond, California

FIGURE

2-1



Source: USGS 7.5 minute topo map, Richmond Quadrangle

URS Consultants
100 California Street
San Francisco, CA 94111
August 10, 1992

Facility Map

Stauffer Chemical Company
(ICI Americas)
Richmond, California

FIGURE

2-2

West of the Stauffer site is the Richmond Field Station (EPA ID# CAD980673628) The Richmond Field Station is currently owned and operated by the University of California The Richmond Field Station was formerly operated by Cal Cap, a firm that manufactures explosives Cal Cap produced explosives at the Richmond Field Station between 1849 and 1945 Explosives manufactured by Cal Cap included dynamite, mercury fulminate silver fulminate, and copper fulminate Cal Cap sold this property to the University of California in 1950 (25)

2.3 Operational History

In 1897, Stauffer purchased the site and had begun chemical production operations by 1906 Stauffer produced a variety of industrial and agricultural chemicals until 1985 In March 1985, Chesebrough-Ponds merged with Stauffer In December 1986 several Chesebrough-Ponds divisions, including Stauffer, were purchased by the Unilever Corporation In 1990, ICI Americas purchased the site from Unilever In 1992 or 1993, ICI Americas divided into two companies, the name of the company containing the Agricultural Products division and the Richmond site is Zeneca Inc Zeneca is the current site owner and operator (2,30)

Stauffer manufactured, formulated, and bulk loaded agricultural and industrial chemicals Chemicals manufactured by Stauffer include sulfuric acid, aluminum sulfate, titanium trichlorate, Vapam, and Devrinol Chemicals formulated by Stauffer include Betasan, Captam, Devrinol, Eptam, Ordram, Ro-Neet, Tillan, and Trithion Chemicals bulk loaded by Stauffer include caustic soda, hydrochloric acid, hydrofluosillic acid, tetrachloroethylene (PCE), carbon disulfide, Sutan, Silbond, and Silbond-40 Trithion is the only formulated organophosphate pesticide manufactured at the facility, all other formulated chemicals are thiocarbamates pesticides Although no information is available regarding Stauffer's use of, formulation, manufacturing, or bulk loading of DDT, an extremely hazardous waste (EH) permit dated August 15, 1983 and obtained from the California Environmental Protection Agency, Department of Toxic Substances Control (Cal EPA DTSC) files The EH permit documents that Stauffer identified two 55-gallon drums containing glass bottles of Parathion, Cythion, Trithion, Dyfonate and DDT for disposal. Concentrations of Parathion of up to 89 percent, Cythion up to 95 percent, Trithion up to 90 percent, Dyfonate up to 90 percent, and DDT up to 79 percent were contained within the glass bottles The proposed method of disposal is checked as being **burial**, however, no disposal facility is identified on the extremely hazardous waste

permit URS has been unable to locate the actual hazardous waste manifest that would identity the transporter and destination where these wastes would ultimately be disposed of (9,15,19)

Prior to 1989, wastewater generated by chemical production and laboratory operations was released to former sedimentation ponds on the Stauffer site Wastewater from some former sedimentation ponds was channeled directly to the tidal marsh Wastewater from other former sedimentation ponds flowed into the two existing on-site evaporation ponds. After passing through the evaporation ponds, wastewater was released into the adjacent tidal marsh and San Francisco Bay Between 1906 and 1974, wastewater was not chemically treated to remove hazardous substances prior to release to the tidal marsh, however, wastewater was treated by a neutralizing system to reduce acidic or basic conditions During this period, an estimated 100,000 gallons of wastewater was released to the tidal marsh on a daily basis Since 1974, wastewater has been passed through a carbon adsorption system to remove organic constituents prior to release to the settling and evaporation ponds (2,31,43,44,45)

In 1989, the wastewater discharge system was overhauled, and wastewater entering the evaporation ponds is now discharged, via pump and pipe, to the Richmond Publicly Owned Treatment Works (POTW) Under the current NPDES permit, runoff water during heavy storm events is designed to flow into the tidal marsh if the 4,000,000-gallon surge capacity of the newly constructed and lined surge ponds is exceeded Surge ponds are located in areas formerly used as the four northeastern most sedimentation ponds (see Figure 2-2, Facility Map) During the heavy rainfalls that occurred during the 1992-1993 winter rainy season it was not necessary to discharge wastewater via the NPDES permit to the tidal marsh. Water collected in the surge ponds is passed through the carbon adsorption system prior to being released to the evaporation ponds (2)

Between 1990 and 1992 ICI's operations at the site were limited to the manufacturing of the thiocarbamate pesticide Vapam, and the formulation of thiocarbamate pesticides Devrinol and Ordram. Agricultural research is conducted at the ICI Western Research Center located at 1200 South 47th Street (2)

As part of the SI, URS reviewed historical aerial photographs from 1953, 1990, etc These photographs indicate the existence of several former sedimentation ponds, wastewater outfalls from the site, the reclamation of land adjacent to the site, and the construction of evaporation ponds Aerial photographs reveal remediation ponds not mentioned in

historical site information or technical reports reviewed by URS. URS used aerial photos to identify areas of possible hazardous materials use or disposal in order to determine appropriate sample locations. Two of these historical aerial photos (from 1973 and 1990) are presented in Figures 4-1 and 4-2 in Section 4.0 of this report (39,40).

2.4 Regulatory Involvement

U.S. Environmental Protection Agency

ICI Americas is listed in the Resource Conservation and Recovery Act (RCRA) database as a large quantity generator for both the 1200 South 47th Street (EPA ID# CAD08079553) and the 1415 South 47th Street production facilities (EPA ID# CAD009123456) as of July 31, 1992. A PA was conducted on the Stauffer site in 1987 by ICF Technology. A PA reassessment of the Stauffer site was conducted in 1988 by ICF Technology for EPA under the Superfund program.

California Regional Water Quality Control Board

The California Regional Water Quality Control Board (RWQCB) has been the lead agency for the Stauffer site. RWQCB has been involved in the oversight of several investigations at the site. These investigations include several underground storage tank removals and remedial investigations, Toxic Pits Cleanup Act (TPCA) investigations, a groundwater Solid Waste Assessment Test (SWAT), and the oversight of permitting under NPDES for wastewater discharge into San Francisco Bay (4,6,9,13,20).

RWQCB originally adopted waste discharge requirements for the Stauffer site in April 1963 and amended those requirements in 1972. A NPDES permit was issued to Stauffer in 1973, reissued in December 1984, and amended in July 1987. In April 1986, RWQCB informed Stauffer of a violation of its NPDES permit due to treatment system bypass incidents that occurred in February 1986. Due to non-compliance with the San Francisco Basin Plan, RWQCB issued a Cease and Desist Order regarding the NPDES permit violation in February 1988; however, the Cease and Desist Order was not issued in connection with a violation of any NPDES effluent limitations. According to ICI Americas representatives, no discharges of wastewater have occurred to San Francisco Bay since February 1988 (5,9).

Bay Area Air Quality Management District (BAAQMD)

ICI Americas currently holds two source permits from the BAAQMD These permits cover the pilot plant research center, and a former stack at the alum and titanium trichloride manufacturing plant. Air quality permits required monitoring for total particulates and nitrogen oxides (9,37).

Contra Costa County Department of Environmental Health

Underground storage tanks were permitted by the Contra Costa County Department of Environmental Health, Hazardous Materials Division (County Health) Permits for the removal of underground storage tanks were issued by County Health The ICI Americas hazardous materials management plan (Business Plan) was filed with County Health in 1989. Prior to 1989, there was no Business Plan filed with County Health (20,23,24).

California Environmental Protection Agency Department of Toxic Substances Control

The California Environmental Protection Agency Department of Toxic Substances Control (Cal EPA DTSC) has conducted biannual plant inspections to determine compliance with state hazardous waste laws and regulations. Other activities conducted by Cal EPA DTSC have included the issuance of extremely hazardous waste disposal permits (15,19)

California Department of Fish and Game

Documented fish kills have occurred due to releases of contaminants attributable to the Stauffer site. In 1960, Stauffer was required to pay civil damages to the California Department of Fish and Game due to a fish kill that occurred near the Stauffer site (7,46,47).

3.0 Investigative Efforts

3.1 Previous Sampling

Sampling at the Stauffer site has occurred in conjunction with underground storage tank investigations, NPDES monitoring and investigations, and a groundwater SWAT of the cinder landfill. Sampling at the Stauffer site has been conducted at the request of RWQCB and County Health.

In January 1980, Stauffer reported to RWQCB the presence of herbicides in the shallow groundwater at the site. In cooperation with RWQCB, Stauffer investigated the extent and impact of site related contaminants and installed a groundwater intercept system. The groundwater intercept system was completed in October 1980. The groundwater intercept system was designed to halt the migration of contaminants and to remediate existing groundwater contamination. The groundwater intercept system consists of an intercept trench and two sumps. Groundwater collected from the sumps is transferred to the on-site activated carbon wastewater treatment system. Between 1981 and 1990 the concentration of total thiocarbamates in nearby monitoring well H28 declined from 4 mg/L to 0.2 mg/L (21).

In 1984, as part of the NPDES permit, analysis of storm water discharging from the Stauffer plant indicated contamination with pesticides, solvents, and metals. Stauffer proposed to determine the origin of contaminants entering the storm drain system by using a video camera to inspect the integrity of the storm drain. Sampling of storm drain waters was also conducted to assist in pinpointing the potential source of contamination. This plan was approved by RWQCB and implemented. RWQCB considered results of the investigation inconclusive. Nonetheless, Stauffer replaced approximately 300 feet of the storm drain line and removed a partially buried skimmer tank from the drain system. A sump has also been installed near the outfall of this storm drain, and dry weather flow is now diverted to the wastewater treatment system (27,28).

On October 24, 1985 SRI International issued a report prepared for the Stauffer Chemical Company describing an investigation for evidence of toxicity related to the discharge of wastewater from the Stauffer site. This report described the general environmental conditions of the evaporation ponds and the tidal marsh area. Both plant and animal communities, including microscopic organisms, were described and inventoried. The

report inferred that based on "the presence of species such as midges, daphnids, and mayflies that are known to be sensitive to environmental contaminants" the discharge of wastewater from the Stauffer site has no discernible effect on terrestrial and aquatic life (51).

On April 17, 1986, a report describing biological results of benthic organism and plankton samples taken from the evaporation ponds was issued to RWQCB The report was prepared by Anatec Laboratories for Stauffer. The purpose of this investigation was to support Stauffer's request for exemption from the NPDES 10 to 1 dilution of wastewater requirement. For this investigation, sediment and water samples were collected from the evaporation ponds. Bioassay tests were performed on water and sediment samples. The results of the bioassay tests showed that the evaporation pond water and sediments were considered to be non-hazardous (29).

On January 5, 1985, a report describing an acute oral toxicity study with mallard ducks and evaporation pond sediments was submitted to Stauffer by Wildlife International, Ltd. The purpose of this study was to evaluate the acute toxicity of evaporation pond sediments administered to mallards in a series of oral doses. The report concluded that the mallard acute oral LD50 value and no-observed effect dosage for pond sediments was greater than 5 milliliters per kilogram of body weight administered daily for 7 days (50).

On January 19, 1987, a sediment bioassay report conducted by Anatec Laboratories Inc was issued to the Stauffer Chemical Company. The purpose of this report was to provide data on the potential toxicity of sediments from the evaporation ponds For this report earthworms (*Lumbriculus variegatus*) were placed in sediments collected from the evaporation ponds. Results of the sediment bioassay test suggest that the tested sediments do not pose an acute toxicity hazard to benthic infauna such as earthworms (48).

On February 2, 1987, a report describing a chronic insitu bioassay of the evaporation ponds with bluegill sunfish (*Lepomis macrochirus*) was issued to the Stauffer Chemical Company by the Richmond Aquatic Toxicology Laboratory. The purpose of this report was to evaluate the survivability and growth of bluegill sunfish placed in the evaporation ponds for a 60-day period. All fish placed in evaporation pond 2 survived the 60-day test period; however, fish placed in evaporation pond 1 survived 42 of the 60 days at which time fatalities began to occur presumably caused by low pH and dissolved oxygen levels in evaporation pond 1. By the end of the test, 49 of the 50 fish placed in evaporation

pond 1 had died Microscopic examination of fish from evaporation pond 1 suggests the cause of mortality to be acute in nature (49)

On November 2, 1987, Stauffer issued an assessment of surface impoundments to RWQCB This assessment was conducted to determine levels of toxic materials in water and sludge from seven surface impoundments at the Richmond site Samples were collected from both evaporation ponds and the five sedimentation ponds in existence at that time Sludge samples collected from evaporation ponds were analyzed for total and soluble concentrations of all California Title 22 metals and fluoride Sludge samples collected from sedimentation ponds were analyzed for total and soluble metals, fluoride, proprietary compounds, and volatile and extractable compounds by EPA Methods 624 and 625. The results of the analysis from evaporation pond sludges revealed arsenic, lead, and proprietary pesticides Analytical results of sedimentation pond water samples revealed elevated levels of copper, lead, fluoride, selenium, zinc, proprietary pesticides, volatile aromatic hydrocarbons, and several purgeable priority pollutants (13)

On March 31, 1988, a report prepared by Anatec Laboratories presenting data collected in response to the Toxic Pits Cleanup Act (TPCA) was issued (2) The investigation for this report included the collection of sediment samples from the evaporation ponds A total of 100 core samples were taken from each of the evaporation ponds Transect sampling of evaporation pond sediments revealed elevated levels of soluble arsenic when analyzed by the California Waste Extraction Test (WET) compared to Soluble Threshold Concentration Limits (STLC) (12)

In August 1991, the Mark Group (consultants for ICI Americas) issued a workplan for the removal of four underground storage tanks The four tanks consisted of three nested 8,000-gallon railroad tank cars that were converted to underground storage tanks (UG1, UG2, and UG3) and one 7,500-gallon underground storage tank, S-79 Each of these underground storage tanks was removed in 1991 Two soil samples were collected from beneath Tank S-79 and analyzed for semivolatile organics by EPA Method 8270 Samples did not reveal detectable concentrations of semivolatile organics Five soil samples including one duplicate sample, were collected from beneath tanks UG1, UG2, and UG3 Soil samples were analyzed for Thiophenol, diphenyl dixulfide, a decomposition product of Thiophenol, and Devrinol. These samples revealed concentrations of Thiophenol up to 4,400 mg/Kg, diphenyl disulfide up to 22,000 mg/Kg, and Devrinol up to 1 9 mg/Kg There are no health-based benchmark concentrations available for substances detected

in soil samples Currently there are no known underground storage tanks at the Stauffer site (20, 53).

In 1991 the Mark Group issued a SWAT report for the cinder landfill to RWQCB The cinder landfill received waste cinders generated as a byproduct of sulfuric acid production This investigation was in response to a RWQCB letter dated January 29, 1990 requiring ICI to submit a Water Quality SWAT The SWAT revealed elevated levels of metals, volatile organic compounds (VOCs), and thiocarbamate pesticides in groundwater Metals detected at elevated concentrations in groundwater samples included arsenic, zinc, iron, copper, and aluminum VOCs detected at elevated concentrations in groundwater samples included chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, xylenes, ethylbenzene, benzene, and toluene Thiocarbamate pesticides detected at elevated concentrations in groundwater samples include Vapam and Tillam General chemistry of groundwater samples collected from wells screened within cinder wastes indicates that groundwater in the area is acidic (pH levels from 4 2 to 7 0), and sulfate is found to be present in elevated concentrations Analysis and characterization of landfill wastes through collection of soil samples were not completed as part of the SWAT investigation (19)

On December 31, 1991, a Report of Closure Certification for the agricultural yard pond, a sedimentation pond, was issued by the Mark Group to RWQCB (see Figure 4-1, Aerial Photograph). Prior to October 1987, Stauffer operated this lined surface impoundment known as the agricultural yard pond. The pond was constructed by Stauffer in 1973 Two closure plans for the agricultural yard pond were submitted to RWQCB in February and May of 1988. A revised closure plan submitted by ICI in June 1991 was approved by RWQCB. The agricultural yard pond was closed in accordance with the approved plan Soil samples collected from the excavation of the agricultural yard pond were analyzed by EPA Methods 8240, 8270, 8080, and Series 7000 The results of the analyses for EPA Methods 8240, 8270, and 8080 indicated that none of the samples tested exceeded the respective method detection limits The results of the Series 7000 metals analysis indicated that the concentration of metals detected was within the background range for the site (14).

For the analytical results of the previously described sampling efforts, see Section 4 0, Hazard Ranking System Factors.

3.2 EPA Sampling

3.2.1 Purpose and Description of Sampling Event

Under the direction of EPA, the URS team prepared a Sample Plan to collect soil and sediment samples at and around the Stauffer site This plan was reviewed by EPA's Quality Assurance Management Section and EPA's Site Mitigation Branch The final Sample Plan was approved by EPA on October 13, 1992

URS conducted sampling of the Stauffer site to identify and determine the absence or presence of hazardous wastes or contaminants in the cinder landfill, former sedimentation ponds, and evaporation ponds (see Figures 3-1, 3-2, and 3-3), and to determine if wastes had migrated from on-site sources to the adjacent tidal marsh areas Samples were collected on October 26, 27, and November 23, 1992 Conductivity and pH measurements were collected from recharge water in each sediment sampling hole Results of sample analysis and conductivity/pH measurements are presented in Section 4 0

A total of six soil samples, including one duplicate and one reference sample, were collected during the URS sampling Two soil samples and one duplicate soil sample were collected from cinder landfill wastes Two soil samples were collected from areas formerly used as sedimentation ponds One reference soil sample was collected from a undeveloped recreational area approximately 0 50 miles south of the site (see Figure 3-2, Background Sample Location Map) Soil samples were collected from a depth of 1 to 3 feet below ground surface (bgs) Soil sample material was collected by hand augering to the specified depth, collecting soil, homogenizing soil in a paper paint bucket using a dedicated plastic trowel, then placing the sample media in 8-ounce glass jars

A total of 21 sediment samples, including three duplicates and three reference samples, were collected during the URS sampling event Fourteen sediment samples, including two duplicates, were collected from tidal marsh areas adjacent to the Stauffer site Two tidal marsh reference sediment samples were collected from the southern side of Hoffman Marsh located approximately 0 50 miles south of the site Four sediment samples, including one duplicate, were collected from the fresh water upper and lower evaporation ponds A reference sediment sample was collected from fresh water sediments in Carlson Creek at East Shore Park, located approximately 0 5 miles northeast of the site, above the zone of tidal influence (see Figure 3-3, Freshwater Background

Sample Location Map). Sediment samples were collected from a depth of 0 to 6 inches bgs. Sample material was collected using a dedicated plastic trowel and homogenizing sediments in a paper paint bucket, then placing the samples in 8-ounce glass jars

Before shipment to the laboratories, samples were custody sealed, entered on a Chain-of-Custody, double bagged, and placed in a cooler with ice for shipment to the laboratories Samples collected during the URS sampling event were analyzed for Routine Analytical Services (RAS) total metals, RAS Organochlorine Pesticides/PCBs, and Special Analytical Services (SAS) organophosphate pesticides. Analyses were performed under EPA's Contract Laboratory Program (CLP) protocol. Data validation was conducted by EPA's Environmental Services Assistance Team (ESAT).

3.2.2 Deviations from Sampling Plan

EPA requested that URS collect one additional sediment sample from a location not previously identified in the sample plan. This additional sediment sample was collected on November 23, 1992 and is denoted E-20. (A duplicate was also taken at this location and is denoted E-21.) An additional laboratory quality control (QC) sediment sample, E-10, was designated for laboratory purposes.

In collecting soil samples, duplicate sample S-6 was collected from soil sampling location S-1 rather than S-2, as specified in the sample plan.

3.2.3 Discussion of Sample Results

Soil and sediment samples were analyzed for RAS total metals, RAS organochlorine pesticides/PCBs, and SAS organophosphate pesticides. Analytical results of soil samples collected from the cinder landfill revealed levels of arsenic, cadmium, copper, mercury, zinc, a-BHC, b-BHC, Lindane, Aldrin, Dieldrin, DDE, DDD, DDT, Endrin aldehyde, alpha-Chlordane, gamma-Chlordane, and Arochlor-1248 at greater than three times background concentrations. Analytical results of soil samples collected from former sedimentation pond areas revealed levels of mercury, Dieldrin, DDE, DDD, DDT, Endrin ketone, alpha-Chlordane and gamma-Chlordane at greater than three times soil background concentrations. Analysis of sediments collected from the fresh water evaporation ponds revealed levels of arsenic, cadmium, copper, a-BHC, b-BHC, Aldrin, Dieldrin, DDE, DDD, DDT, Dichlorvos, and tetraethyl phosphate (TEPP) at greater than three times background concentrations from Carlson Creek. Analysis of sediments collected from tidal marsh areas revealed levels of arsenic, cadmium, copper, lead, mercury, zinc, a-BHC,

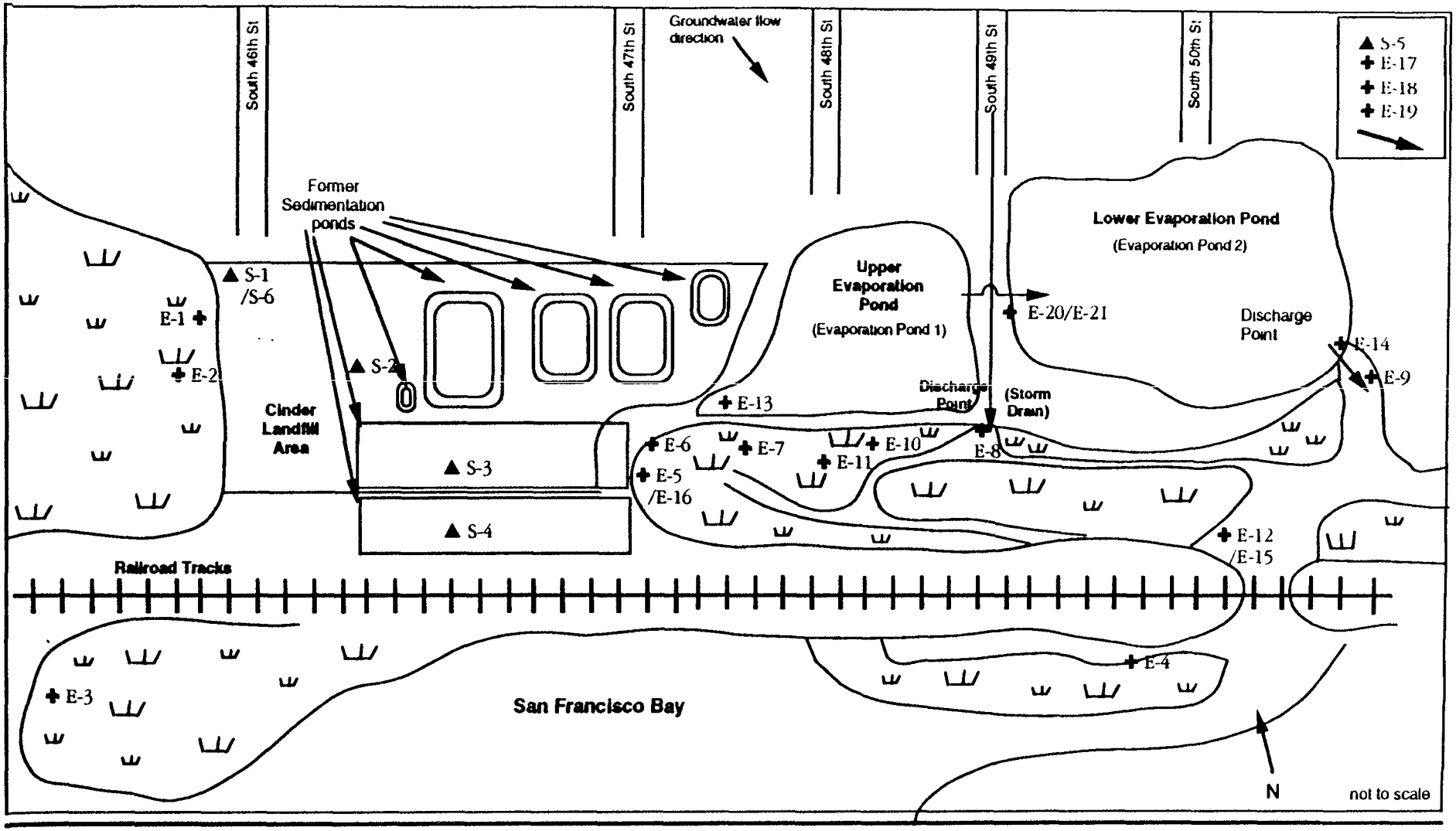


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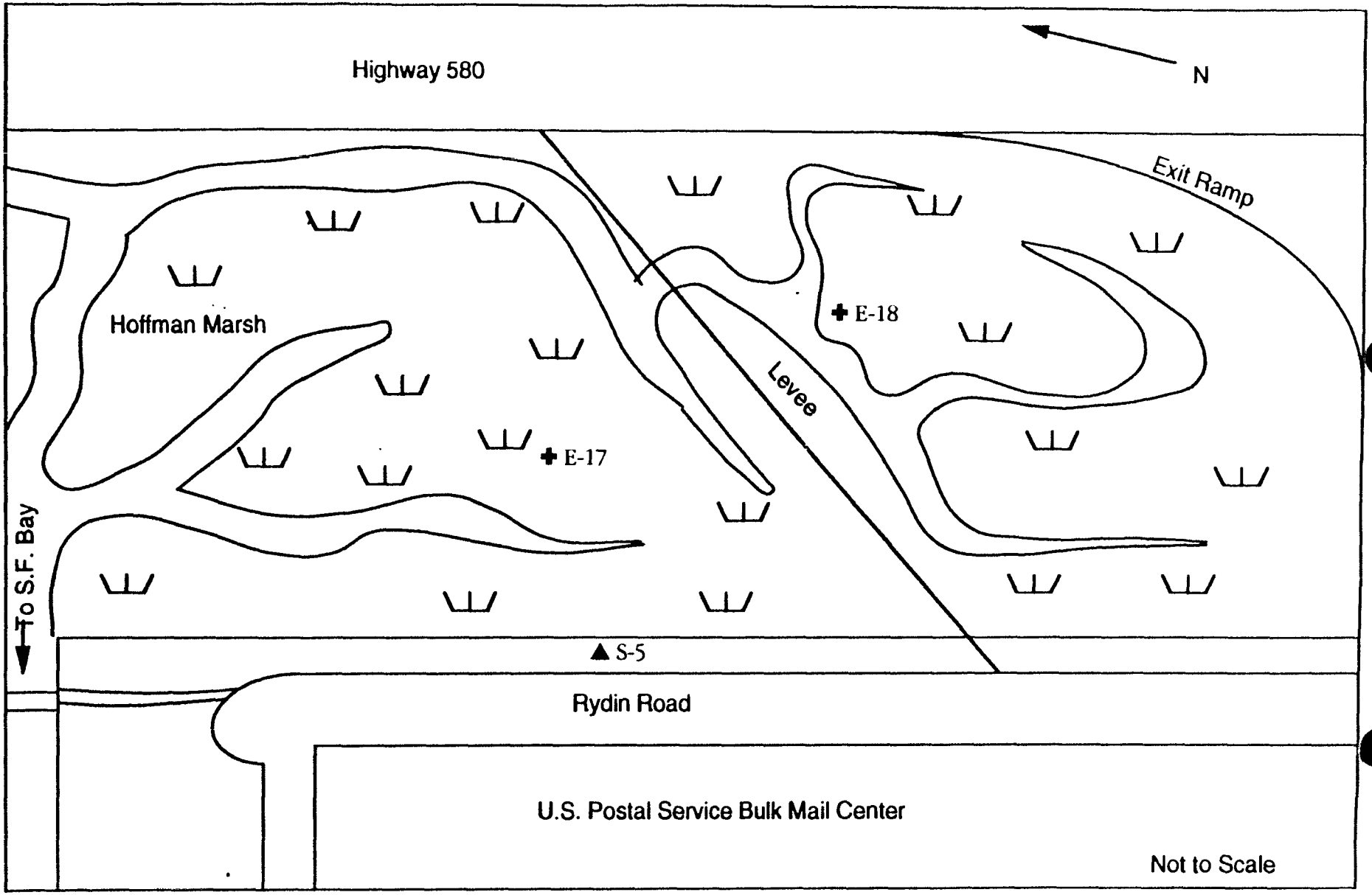
Figure 3-1
Sample Location Map
Stauffer Chemical Company
Richmond, California

Key
- E- = Sediment Sample Location
- S- = Soil Sample Location
- = Wetland Area



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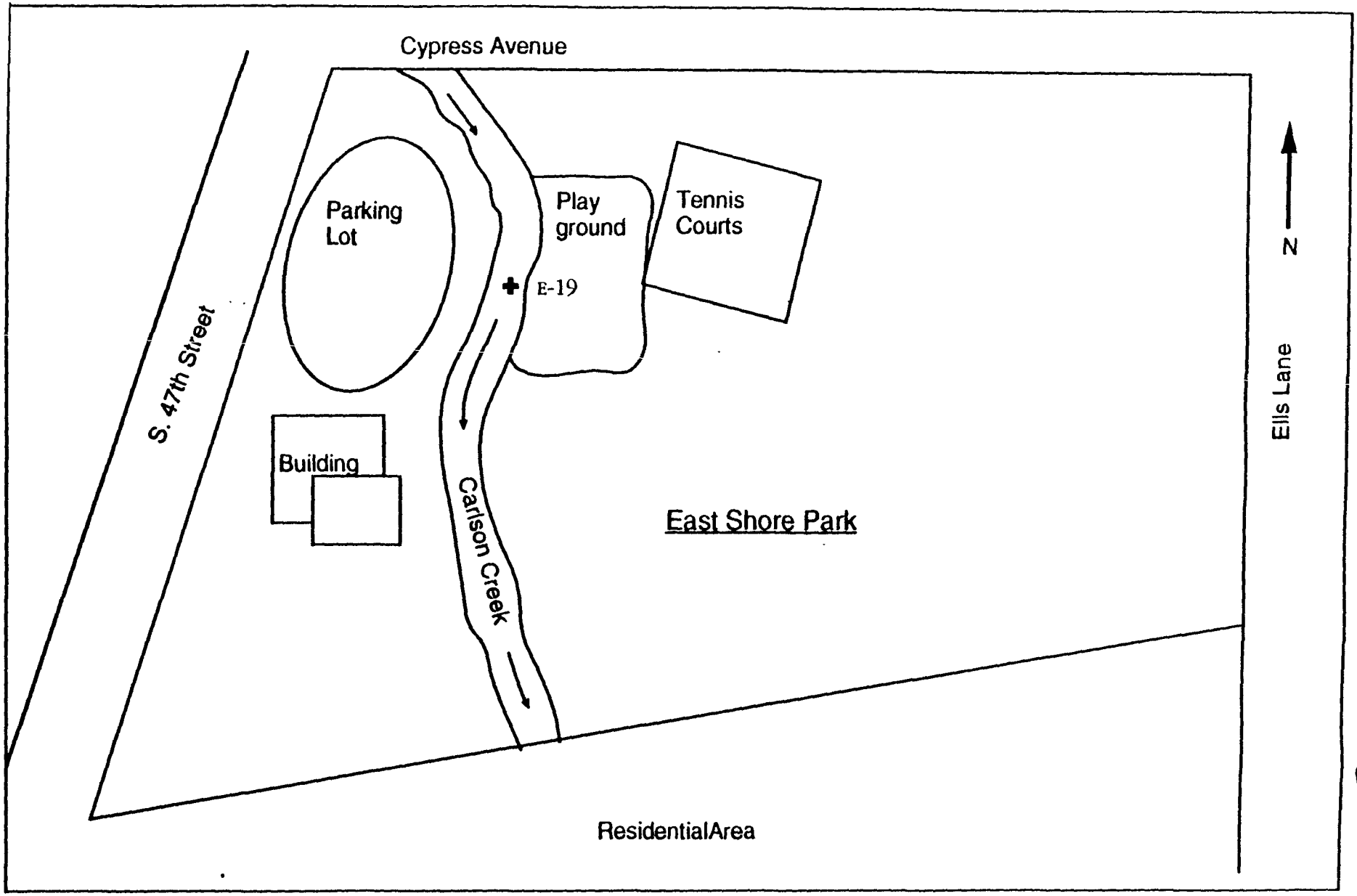
San Francisco, Ca 94111
January 25, 1993

Figure 3-2
Sample Location Map
Stauffer Chemical Company
Richmond, California

Key
- E- = Sediment Sample Location
- S- = Soil Sample Location
- = Wetland Area



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January 25, 1993

Figure 3-3
Sample Location Map
Stauffer Chemical Company
Richmond, California

Key
✚ E- = Sediment Sample Location
Not to Scale

b-BHC, d-BHC, Lindane, Aldrin, Dieldrin, DDE, DDD, DDT, Endrin, Endrin ketone, Endrin aldehyde, alpha-Chlordane, gamma-Chlordane, Toxaphene, and Arochlor-1248 at greater than three times background concentrations. Sampling results indicate that contaminants found in the cinder landfill and evaporation ponds have migrated to the adjacent tidal marsh. Refer to subsections within Section 4.0 for analytical results of the URS sampling effort.

Analytical data packages, including explanations of data qualifiers, can be found in Appendix E, Validated Analytical Data Packages of URS Sampling. Overall there was acceptable correlation between standard and duplicate samples; however, samples E-20 and duplicate E-21 showed some inconsistent results. This variation is attributable to the inability to obtain homogeneity in the sediment sample media.

4.0 Hazard Ranking System Factors

The Hazard Ranking System (HRS) is a scoring system used to assess the relative threat associated with actual or potential releases of hazardous substances from sites It is the principal mechanism EPA uses to place sites on the National Priorities List (NPL) URS has evaluated the following HRS factors relative to this site

4.1 Sources of Contamination

URS was able to document six sources (or source groups) of contamination at the Stauffer site the cinder landfill, former sedimentation ponds, evaporation ponds, the wastewater outfalls, surge ponds, and hazardous wastes stored on-site

Cinder Landfill

The cinder landfill contains waste material generated from the production of sulfuric acid From about 1919 to 1963 pyrite ores were roasted at the site to produce sulfuric acid The sulfuric acid production operation resulted in the accumulation of waste cinders Some waste cinders were sold to the Mountain Copper Company and shipped off-site The remainder of the waste cinders was placed in the cinder landfill, used as general fill material at the site, or placed into the tidal marsh of San Francisco Bay No liners were installed prior to the placement of the cinders Cinders were spread across the ground surface and lie directly on native soils and sediments The base of the cinder landfill is approximately at sea level and is about 10 feet thick There is an estimated 15,000 cubic yards of waste material in the cinder landfill The cinder landfill was closed in 1974 in accordance with RWQCB Order Number 73-12 and its 1974 amendments Since 1974 no additional cinder disposal has occurred Cinder wastes had not been sampled prior to the URS sampling conducted at the Stauffer site in 1992 (19)

Samples of cinder landfill wastes were collected by the URS team on October 26, 1992 and analyzed for total metals, PCBs/organochlorine pesticides, and organophosphate pesticides Results of metals analysis performed on soil samples from the cinder landfill revealed elevated levels of arsenic up to 294 milligrams per kilogram (mg/Kg), cadmium up to 15 5 mg/Kg, copper up to 1,310 mg/Kg, mercury up to 30 2 mg/Kg, and zinc up to 2,240 mg/Kg Results of PCBs/organochlorine pesticide analysis performed on soil samples from the cinder landfill revealed elevated levels of a-BHC up to 150 micrograms per kilogram (µg/Kg), b-BHC up to 35 µg/Kg, Lindane up to 27 µg/Kg, Dieldrin up to 52 µg/Kg, DDE up to 410 µg/Kg, DDD up to 170 µg/Kg, DDT up to 1,800 µg/Kg, Endrin

ketone up to 7 µg/Kg, Endrin aldehyde up to 15 µg/Kg, alpha-Chlordane up to 22 µg/Kg, gamma-Chlordane up to 34 µg/Kg, and Aroclor-1248 (a PCB) up to 640 µg/Kg It is not known how or when pesticides and PCBs were transported to the cinder landfill Results of organophosphate pesticide analysis performed on soils did not reveal detectable levels of any analytes Analytical results of soil samples and appropriate health-based benchmark concentrations for the above mentioned contaminants are listed in Tables 4-1 and 4-2 See Appendix E for full analytical data packages

Former Sedimentation Ponds

Sedimentation was a widely used method of wastewater treatment at the Stauffer site As many as ten former sedimentation ponds were known to exist at the site at various times (see Figures 4-1 and 4-2, Aerial Photographs) Former sedimentation ponds overflowed during heavy storm events and may have released contaminants directly to the adjacent tidal marsh Five former sedimentation ponds were evaluated as part of a TPCA Assessment of Surface Impoundments prepared by Stauffer in 1987 These ponds included the alum mud pond, the carbon column pond, the agricultural yard pond (Ag-Pond), the neutralization pond, and one surge pond Two additional sedimentation ponds were identified at the southern end of the Stauffer site by URS in an aerial photograph dated April 1973 (see Figure 4-2) The former sedimentation ponds evaluated in this report include the alum mud pond, the carbon column pond, the neutralization pond, the clarification ponds, the agricultural yard pond, and the two ponds identified by URS RWQCB considers none of the sedimentation ponds to be lined. The alum mud pond, the carbon column pond, the Ag-Pond, the neutralization pond, and the clarification ponds were closed between 1988 and 1992 under the supervision of RWQCB (3,5,13,22,29,39)

The Alum Mud Pond

The alum mud pond had a volume of 200,000 cubic feet (1,496,104 gallons) It is not known when the alum mud pond was constructed The alum mud pond was closed, relined, and converted into a surge pond in 1992 The alum mud pond received wastes, mud, and wash liquor from the manufacture of aluminum sulfate Overflow incidents involving the alum mud pond have been documented by site operators between 1960 and 1987 During overflow incidents, wastewater may have flowed directly into the tidal marsh In 1985 and 1986, due to mechanical malfunctions, untreated wastewater held in

Table 4-1

Stauffer Chemical Company
Analytical Results of Soil Samples for Total Metals
October 1992

Concentrations in mg/Kg

Sample Number / Compound	S-1 D1	S-2	S-3	S-4	S-5 BG	S-6 D1	Reference Dose Screening Concentration	Cancer Risk Screening Concentration
aluminum	5,730 J	19,500 J	22,800 J	30,400 J	29,900 J	5,410 J	---	---
antimony	ND	16 7	ND	ND	ND	ND	230	---
arsenic	294	145	9 0 J	5 5 J	2 2 J	216	170	0 33
barium	192	220	206	198	183	81 7	41,000	---
beryllium	ND	0 56 J	0 73 J	0 89 J	0 90 J	ND	2,900	0 14
cadmium	5 3	15 5	ND	ND	ND	4 1	290	---
calcium	2,760	31,900	7,050	6,530	5,300	2,350	---	---
chromium	17 0 J	49 6 J	62 1 J	68 6 J	94 7 J	15 2 J	2,900	---
cobalt	ND	10 1 J	13 8	16 1	22 4	ND	---	---
copper	389	1,310	37 9 J	27 7 J	26 2 J	319 J	---	---
iron	185,000	79,600 J	28,100 J	28,600 J	29,300 J	154,000 J	---	---
lead	338	678	35 5	10 8 J	240	255	---	---
magnesium	1,140	4,260	7,990	8,220	6,270	1,040 J	---	---
manganese	93 5 J	405 J	589 J	694 J	787 J	84 8 J	58,000	---
mercury	7 8	30 2	0 13	0 11	ND	9 9	170	---
nickel	10 5	48 7	63 6	67 1	65 3	12 9	1,200	---
potassium	1,910 J	2,020 J	2,160 J	3,220 J	ND	1,550 J	---	---
selenium	50 5 J	65 3	ND	ND	ND	21 2	2,900	---
silver	ND	3 7 J	ND	ND	ND	ND	2,900	---
sodium	1,070 J	1,350 J	410 J	441 J	1,140 J	863 J	---	---
thallium	ND	ND	ND	ND	ND	ND	---	---
vanadium	38 6	63 3	59 4	61 3	84 8	33 3	---	---
zinc	1,050 J	2,240 J	89 5 J	66 9 J	78 7 J	827 J	120,000	---

Notes:
J = The results are estimated and the data are valid for limited purposes, results are qualitatively acceptable
D1 = Field Duplicate Pairs
BG = Background
ND = Not Detected
--- = Not Available

Table 4-2

Stauffer Chemical Company
Analytical Results of Soil Samples for PCB/Pesticides
October 1992

Concentrations in µg/Kg

Compound	S-1 D1	S-2	S-3	S-4	S-5 BG	S-6 D1	Reference Dose Screening Concentration	Cancer Risk Screening Concentration
alpha-BHC	91	150	ND	ND	ND	77	---	0.093
beta-BHC	20	35 J	ND	ND	ND	19	---	0.32
delta-BHC	4	ND	ND	ND	ND	4	---	---
gamma-BHC (Lindane)	6 J	27 J	ND	ND	ND	6 J	170	0.45
Dieldrin	52	30 J	3 J	ND	ND	46	290	0.036
4,4'-DDE	40	410	3 J	ND	ND	40	---	1.7
4,4'-DDD	58 J	170 J	10	ND	ND	60 J	---	2.4
4,4'-DDT	490	1,800	19	1 J	ND	430	290	1.7
Endrin Ketone	6	ND	2 J	ND	ND	7	---	---
Endrin Aldehyde	5	15	ND	ND	ND	6	---	---
alpha-Chlordane	15	22	2 J	ND	ND	15	35	0.45
gamma-Chlordane	29 J	34	2 J	ND	ND	28	---	---
Arochlor-1248 (PCB)	590 J	640	ND	ND	ND	570 J	---	0.076

Notes:
J = The results are estimated and the data are valid for limited purposes; results are qualitatively acceptable.
D1 = Field Duplicate Pairs
BG = Background
ND = Not Detected
--- = Not Available

the alum mud pond was allowed to bypass the carbon adsorption system and was discharged to the tidal marsh

Sampling of solids in the alum mud pond reported in a February 1982 report revealed elevated levels of aluminum at up to 100,000 milligrams per liter (mg/L), cadmium at up to 20,000 mg/L, copper at up to 30 mg/L, mercury at up to 290 mg/L, lead at up to 200 mg/L, and titanium at up to 10,000 mg/L The validity of this data has been questioned by the current site operator, ICI Americas Alum mud pond solids were determined to be non-hazardous by RWQCB in 1987 (5,9,13,31)

The Carbon Column Pond

The carbon column pond holds water prior to its treatment in the carbon adsorption system The pond covers an area of approximately 6,400 square feet It is unknown when the carbon column pond was constructed, however, it has been in operation since the carbon adsorption system was constructed in 1974 The carbon column pond was relined with 60 mil high density polyethylene (HDPE) in 1988 Sludge samples collected from the carbon column pond in 1987 were analyzed for proprietary compounds, volatile aromatics, and California Title 22 metals Analysis for soluble metals was conducted on samples where total metal concentrations exceeded ten times the Total Threshold Limit Concentration (TTLC) (see Tables 4-3 and 4-4) Analysis of sludge samples for total and soluble metals did not reveal concentrations in excess of State of California TTLC or Soluble Threshold Limit Concentration (STLC) limits Proprietary pesticides revealed by the analysis of sludge samples included S-ethyldipropylthiocarbamate (EPTC), Butylate, Vernolate, Pebulate, Molinate, Cycloate, Mapropamid, and Vapam (see Table 4-5) (13)

Proprietary pesticides revealed by the analysis of water samples included EPTC, Butylate, Vernolate, Pebulate, Molinate, Cycloate, and Mapropamid (see Table 4-6) Volatile aromatics detected in water samples when analyzed by EPA Method 8020 included xylenes and 1,4-dichlorobenzene at concentrations of up to 0 09 mg/L and 0 02 mg/L, respectively Priority pollutants detected in water samples when analyzed by EPA Methods 624 and 625 include 1,1-dichloroethane (DCA), benzene, chlorobenzene, carbon tetrachloride, chloroform, methylene chloride, tetrachloroethylene, trichloroethylene (TCE), and toluene (see Table 4-7) (13)

Table 4-3
Stauffer Chemical Company
Total Metals in Sludge Samples, Maximum Values
TPCA Assessment, 1987

Concentrations in mg/Kg

Description	NP	CCP	AYP	SRG	EV1	EV2	RfD	CR	TTLC
antimony	12.3	12.2	22.0	12.0	ND	ND	230	---	500
arsenic	60	7.4	14	15	159	208	170	0.33	500
barium	123	125	110	30	144	65	41,000	---	10,000
beryllium	0.2	0.3	1.6	0.3	0.3	ND	2,900	0.14	75
cadmium	3	24	34	4	3.5	9.4	290	---	100
chromium	13.7	24.9	12.6	12.6	62	17	2,900	---	500
cobalt	9	18	27	10	10	2	---	---	8,000
copper	429	999	10,631	456	570	649	---	---	2,500
lead	522	193	72	134	143	130	---	---	1,000
molybdenum	15	10	17	6	15	16	---	---	3,500
nickel	15	46	55	23	14	47	1,200	---	2,000
selenium	67	20	44	24	36	28	2,900	---	100
silver	2.8	6.4	<0.5	0.3	1.9	1.1	2,900	---	500
thallium	ND	ND	ND	ND	ND	ND	---	---	700
vanadium	36	24	55	ND	28	57	---	---	2,400
zinc	448	7,275	10,099	832	1,235	602	120,000	---	5,000

NP = Neutralization Pond
CCP = Carbon Column Pond
AYP = Agricultural Yard Pond
SRG = Surge Pond
EV1 = Evaporation Pond 1
EV2 = Evaporation Pond 2

TTLC = Total Threshold Limit Concentration Values

RfD = Reference Dose Screening Concentration
CR = Cancer Risk Screening Concentration
ND = Not Detected

Table 4-4
Stauffer Chemical Company
Soluble Metals in Sludge Samples by Waste Extraction Test
Maximum Values
TPCA Assessment, 1987

Concentrations in mg/L

Description	NP	CCP	AYP	SRG	EV1	EV2	STLC
arsenic	1.6	NA	NA	NA	7.8	9.0	5
cadmium	NA	ND	0.9	NA	NA	NA	1
chromium	NA	NA	NA	NA	0.4	3.1	560
copper	0.6	ND	600	11.4	11	0.14	25
lead	18.2	0.04	0.2	0.9	3.4	55	5
fluoride	100	40	310	190	150	140	180
selenium	0.5	0.6	1.1	0.7	0.4	0.5	1
zinc	NA	106	279	23	NA	NA	250

NP = Neutralization Pond
CCP = Carbon Column Pond
AYP = Agricultural Yard Pond
SRG = Surge Pond
EV1 = Evaporation Pond 1
EV2 = Evaporation Pond 2

STLC = California Soluble Threshold Limit Concentration
NA = Not Analyzed
ND = Not Detected

Table 4-5
Stauffer Chemical Company
Proprietary Pesticides in Sludge Samples, Maximum Values
TPCA Assessment, 1987

Concentrations in mg/Kg

Compound Description	EPTC	Butylate	Vernolate	Pebulate	Molinate	Cycloate	Napropamide	Vapam *
NP	ND	ND	ND	ND	ND	ND	0.17	ND
CCP	34.6	3.65	4.62	8.61	48.4	4.90	260	3.54
AYP	0.54	0.059	0.24	1.97	7.12	0.73	1.09	ND
SRG	0.27	0.02	0.03	0.11	3.80	0.04	0.57	ND
EV1	0.13	0.02	0.02	0.38	0.02	0.04	0.78	0.47
EV2	210	4.0	76	280	250	29	58	ND

NP = Neutralization Pond
CCP = Carbon Column Pond
AYP = Agricultural Yard Pond
SRG = Surge Pond
EV1 = Evaporation Pond 1
EV2 = Evaporation Pond 2

* Analyzed as the hydrolysis product: methylisothiocyanate; reported as Vapam.

EPTC = S-Ethyldipropylthiocarbamate
ND = Not Detected
There are no health-based benchmarks for these propriatery pesticides.

Table 4-6
Stauffer Chemical Company
Proprietary Pesticides in Water Samples
TPCA Assessment, 1987

Concentrations in mg/L

Description	NP	CP	CCP	AYP	SRG	EV1	EV2
EPTC	ND	ND	0.050	0.19	ND	ND	ND
Butylate	ND	ND	0.001	0.002	ND	ND	ND
Vernolate	ND	ND	0.005	0.017	ND	ND	ND
Pebulate	ND	ND	0.021	0.089	ND	ND	ND
Molinate	ND	ND	0.34	0.95	ND	ND	ND
Cycloate	ND	ND	0.007	0.026	ND	ND	ND
Napropamide	0.002	ND	0.014	0.007	ND	ND	ND
Vapam *	ND	ND	ND	ND	ND	ND	ND

NP = Neutralization Pond
CP = Clarification Pond
CCP = Carbon Column Pond
AYP = Agricultural Yard Pond
SRG = Surge Pond
EV1 = Evaporation Pond 1
EV2 = Evaporation Pond 2

* Analyzed as the hydrolysis product: methylisothiocyanate; reported as Vapam.

EPTC = S-Ethyldipropylthiocarbamate
ND = Not Detected
There are no health-based benchmarks for these proprietary pesticides.

Table 4-7
Stauffer Chemical Company
Purgeable Priority Pollutants in Water Samples, Maximum Values
TPCA Assessment, 1987

Concentrations in µg/L

Description	NP	CP	CCP	AYP	SRG	EV1	EV2	AWQC
1,1-DCA	40	30	57	40	3	29	ND	---
1,1-DCE	ND	ND	1	ND	ND	ND	ND	---
benzene	ND	ND	51	ND	ND	ND	ND	---
chlorobenzene	ND	ND	46	260	ND	ND	ND	---
carbon Ttetrachloride	ND	ND	3	ND	ND	ND	ND	---
chloroform	ND	ND	47	ND	ND	ND	ND	---
ethyl benzene	ND	ND	1	ND	ND	ND	ND	---
methylene chloride	ND	ND	2,200	ND	ND	ND	ND	---
PCE	ND	ND	7	30	ND	2	ND	---
TCE	ND	ND	11	40	ND	ND	ND	---
toluene	ND	ND	1,000	20	ND	ND	ND	---
naphthalene	ND	ND	ND	ND	ND	ND	ND	---
1,2-dichlorobenzene	ND	ND	ND	6	ND	ND	ND	---

NP = Neutralization Pond
CP = Clarification Pond
CCP = Carbon Column Pond
AYP = Agricultural Yard Pond
SRG = Surge Pond
EV1 = Evaporation Pond 1
EV2 = Evaporation Pond 2

ND = Not Detected
AWQC = Ambient Water Quality Criteria Benchmark

The Neutralization Pond

The neutralization pond was constructed on or before 1972 and relined in 1990 The pond has a volume of 15,000 cubic feet (112,208 gallons) The neutralization pond was used to hold acidic wastewater prior to treatment by the neutralization system (13,31,39)

Wastewater directed to the neutralization pond was generated in the production of titanium trichloride, Vapam, and alum Additional wastewater directed to the neutralization pond was generated in the research laboratory or by storm water drainage Sludge and water samples from the neutralization pond were collected and analyzed as part of the 1987 Assessment of Surface Impoundments for TPCA Water samples collected were generally free of contamination with metals, however, sludge samples analyzed for total metals revealed arsenic up to 60 mg/Kg, barium up to 123 mg/Kg, cadmium up to 3 mg/Kg, chromium up to 13 7 mg/Kg, copper up to 429 mg/Kg, lead up to 522 mg/Kg, vanadium up to 36 mg/Kg, and zinc up to 448 mg/Kg (see Table 4-3) Additional analysis of sludge samples for soluble metals by the California Waste Extraction Test (WET) revealed concentrations of lead up to 18 2 mg/L, greater than the STLC of 5 mg/L (see Table 4-4) Water samples when analyzed for volatile aromatic hydrocarbons by EPA Method 8020 revealed 1,1-DCA at levels up to 40 µg/L (see Table 4-7) Once processed by the neutralization system, wastewater would then be transferred to the clarification ponds (13)

The Clarification Ponds

The clarification ponds consisted of two ponds with a combined volume of 200,000 cubic feet (1,496,104 gallons) It is not known when the clarification ponds were constructed, however, they were present in a 1973 aerial photograph (see Figure 4-2) In 1985 and 1986, due to mechanical malfunctions, untreated wastewater held in the clarification ponds was allowed to bypass the carbon adsorption system and discharged to the tidal marsh The clarification ponds were closed, relined, and converted into surge ponds in 1990 The clarification ponds received wastewater from the neutralization system Only water samples were collected from the clarification ponds as part of the 1987 Assessment of Surface Impoundments for TPCA because at the time of the sampling, the ponds had been recently relined and contained no sludges Analysis of water samples revealed only arsenic at 0 003 µg/L and zinc at 0 03 µg/L Ambient Water Quality Criteria (AWQC) benchmarks for arsenic and zinc are 190 µg/L and 110 µg/L, respectively Water samples analyzed for volatile aromatic hydrocarbons by EPA Method 8020 revealed 1,1-DCA at

levels up to 30 µg/L (see Table 4-7). Once wastewater was treated by the clarification ponds, it was then transferred to the evaporation ponds (13).

The Agricultural Yard Pond (Ag-Pond)

The Ag-Pond was constructed by Stauffer in 1973 and closed by ICI Americas in 1991. The Ag-Pond covered an area of 3,429 square feet and was up to 9 feet deep. The Ag-Pond was designed to contain surface runoff and discharges from the research center and pilot plant. The Ag-Pond also received wastewater generated by the groundwater intercept system. Sludge and water samples from the Ag-Pond were collected and analyzed as part of the 1987 Assessment of Surface Impoundments for TPCA. Analysis of sludge samples revealed antimony up to 22.0 mg/Kg, arsenic up to 14 mg/Kg, barium up to 110 mg/Kg, beryllium up to 1.6 mg/Kg, cadmium up to 34 mg/Kg, chromium up to 12.6 mg/Kg, copper up to 10,631 mg/Kg, lead up to 72 mg/Kg, nickel up to 55 mg/Kg, selenium up to 44 mg/Kg, vanadium up to 55 mg/Kg, and zinc up to 10,099 mg/Kg (see Table 4-3). When sludge samples were analyzed for soluble metals by the WET, analysis revealed elevated levels of copper up to 600 mg/L, fluoride up to 310 mg/L, selenium up to 1.1 mg/L, and zinc up to 279 mg/L (see Table 4-4). Water samples analyzed for volatile aromatic hydrocarbons by EPA Method 8020 revealed 1,1-DCA up to 40 µg/L, chlorobenzene up to 260 µg/L, PCE up to 30 µg/L, TCE up to 40 µg/L, toluene up to 20 µg/L, and 1,2-dichloro benzene up to 6 µg/L (see Table 4-7) (13,14).

A report describing the closure of the Ag-Pond was issued by ICI Americas to RWQCB on December 31, 1991. The closure plan for the Ag-Pond was approved by RWQCB on September 4, 1991. The Ag-Pond was excavated to a depth of 9 feet and backfilled with clean soil then capped with asphalt (13,14).

Two South Former Sedimentation Ponds

As mentioned previously in this report URS located two former sedimentation ponds with the use of aerial photographs from 1973 (39). Soil samples S-3 and S-4 were collected from the areas where these ponds were believed to exist. Analytical results from samples S-3 and S-4 reveal levels of mercury up to 0.13 mg/Kg, Dieldrin up to 3 µg/Kg, DDE up to 3 µg/Kg, DDD up to 10 µg/Kg, DDT up to 19 µg/Kg, Endrin ketone up to 2 µg/Kg, alpha-Chlordane up to 2 µg/Kg, gamma-Chlordane up to 2 µg/Kg at levels greater than three times background levels (see Tables 4-1 and 4-2). Evidence suggests that these ponds contain calcium fluoride and other residuals from the production of superphosphate (42).

Evaporation Ponds

The evaporation ponds consist of two large ponds with a combined volume of 630,000 cubic feet (4,712,727 gallons). The evaporation ponds are believed to have been constructed between 1968 and 1973; however, ponds used by Stauffer were present at the evaporation pond locations prior to 1953 according to aerial photos The evaporation ponds are used to contain and treat wastewater produced in plant operations. Core samples collected from beneath the evaporation ponds reveal that the evaporation ponds were constructed atop layers of sludge and cinders. Sludge is present in the top section of the evaporation pond sediments up to 72 inches thick. Cinders lie beneath the sludge and are up to 64 inches thick (12,41).

Sediment samples were collected from the sludge materials, analyzed by the WET for soluble metals, and reported to RWQCB in the November 1987 Assessment of Surface Impoundments for TPCA. Results of the analyses reveal elevated levels of arsenic up to 9.0 mg/L, copper up to 11 mg/L, lead up to 55 mg/L, fluoride up to 150 mg/L, and selenium up to 0.5 mg/L (see Table 4-4). There are no benchmarks for contaminants found in sediment samples. Results of transect sampling (the collection of core samples along lines crossing the evaporation ponds) of the evaporation ponds were presented in a TPCA Sampling Program report submitted to RWQCB in March 1988. Samples collected from evaporation pond 1 (upper evaporation pond) were analyzed for total arsenic. Core samples collected from evaporation pond 2 (lower evaporation pond) were analyzed for total arsenic and total lead. Analysis of evaporation pond 1 core samples revealed levels of arsenic up to 14 mg/L. Analysis of core evaporation pond 2 core samples revealed arsenic up to 5.1 mg/L and lead up to 6.1 mg/L (12,13).

Aquatic toxicity tests (bioassays) were also performed on evaporation pond sediments. As part of the bioassay, 25 core samples were obtained from each evaporation pond and composited. Five-hundred grams of the composite sludge material from each pond was then placed in a separate 50-liter tank with juvenile rainbow trout (*Salmo gairdneri*) for 96 hours. All trout survived a 96-hour exposure to sediments from each evaporation pond (12).

Samples of evaporation pond sediments were collected by the URS team on October 27, 1992 and analyzed for RAS total metals, RAS organochlorine pesticides/PCBs, and SAS organophosphate pesticides. Results of metals analysis of the URS sampling of evaporation pond sediments reveal elevated levels of arsenic up to 67.0 mg/Kg, copper

up to 1,930 mg/Kg, lead up to 210 mg/Kg, mercury up to 2.8 mg/Kg, and zinc up to 5,490 mg/Kg (see Table 4-8). Results of PCBs/organochlorine pesticide analysis of the EPA sampling of evaporation pond sediments revealed elevated levels of a-BHC up to 38 µg/Kg, b-BHC up to 20 µg/Kg, d-BHC up to 39 mg/Kg, Aldrin up to 10 µg/Kg, Dieldrin up to 14 µg/Kg, 4,4-DDE up to 120 µg/Kg, 4,4-DDD up to 180 µg/Kg, 4,4-DDT up to 74 µg/Kg, alpha-Chlordane up to 7 mg/Kg, and gamma-Chlordane up to 10 mg/Kg (see Table 4-9) Results of Organophosphorous Pesticide analysis of the EPA sampling of evaporation pond sediments revealed elevated levels of Dichlorvos up to 70 µg/Kg and tetraethyl phosphate (TEPP) up to 370 µg/Kg (see Table 4-10) URS sample locations are shown in Figures 3-1, 3-2, and 3-3. There are no health-based benchmarks for contaminants found in sediments (32).

Wastewater Outfalls

Storm water runoff and some wastewater generated from the developed and undeveloped areas of the Stauffer site are collected in storm drain systems that discharge to the tidal marsh. Stauffer generated and disposed of approximately 100,000 gallons of wastewater on a daily basis NPDES permits for two outfalls, labeled 001 and 002 (see Figures 4-3 and 4-4), were issued to Stauffer by RWQCB in 1973. A RWQCB report dated December 18, 1984 states that the storm water discharge 002 contains several herbicides and toluene believed to be from groundwater infiltration into the storm sewer. An investigation of this possible groundwater infiltration into the storm sewer was conducted, but results of this investigation were inconclusive Currently dry-weather discharges from discharge 002 are pumped to the carbon adsorption system and then to the evaporation ponds, and eventually to the Richmond POTW Sediment samples E-9 and E-8 were collected from near discharge points 001 and 002, respectively Sediment sample E-7 was collected near an interim discharge point described in Figure 4-4 Wastewater was also discharged directly from the two former sedimentation ponds that were located by URS to the tidal marsh near sediment sampling location E-5 (see Figure 4-2) (9,27,28).

Surge Ponds

Surge ponds have replaced the five former sedimentation ponds. Although the location is the same, these surge ponds serve a different purpose. Between 1987 and 1992, the former sedimentation ponds were emptied and lined with 60 mil HDPE to create the current surge ponds. The total capacity of the surge ponds is 4,000,000 gallons The surge

Table 4-8

Stauffer Chemical Company
Analytical Results of Sediment Samples for Total Metals
October and November 1992

Concentrations in mg/Kg

Compound	E-1	E-2	E-3	E-4	E-5 D1	E-6	E-7
aluminum	3,810 J	3,190 J	25,700 J	29,100 J	16,700	3,460 J	7,130 J
antimony	ND	ND	ND	ND	ND	ND	ND
arsenic	496	749	96.3	20.3 J	104 J	20.6	146
barium	71.9	100	63.4 J	65.5 J	75.6 J	26.8 J	66.5 J
beryllium	ND	ND	0.91 J	0.88 J	ND	ND	ND
cadmium	4.1	3.9	ND	ND	ND	ND	ND
calcium	505 J	766 J	3,570	3,450	2,570 J	1,530 J	1,140 J
chromium	14.0 J	12.5 J	82.1 J	94.6 J	43.3 J	11.2 J	57.1 J
cobalt	ND	ND	9.7 J	13.8 J	ND	ND	ND
copper	315 J	239 J	169 J	88.7 J	649 J	ND	34.4 J
iron	158,000 J	251,000 J	36,600 J	36,500 J	180,000 J	407,000 J	444,000
lead	310	563	145	74.8	69.2 J	10.0 J	54.7 J
magnesium	1,110 J	1,280 J	10,200	12,800	5,940	1,240 J	998 J
manganese	31.9 J	48.4 J	239 J	266 J	44.2 J	35.8 J	55.1 J
mercury	10.9	5.8	5.3	0.89	1.9	ND	0.88
nickel	ND	ND	61.4	83.6	ND	ND	ND
potassium	2,840 J	14,200 J	4,370 J	4,600 J	12,300 J	53,800 J	46,200
selenium	60.7	124	ND	ND	ND	ND	ND
silver	ND	ND	ND	ND	ND	ND	ND
sodium	5,080 J	10,100 J	12,700 J	12,800	30,900 J	22,200 J	16,400 J
thallium	ND	ND	ND	ND	ND	ND	ND
vanadium	31.2	27.2	73.1	73.4	65.9	34.7 J	103
zinc	957 J	863 J	215 J	231 J	431 J	31.6 J	150 J

Notes:
J = The results are estimated and the data are valid for limited purposes; results are qualitatively acceptable.
D1, D2, D3 = Field Duplicate Pairs
BG = Background
ND = Not Detected
There are no health-based benchmarks for contaminants found in sediments.

Table 4-8 (Cont.)

Stauffer Chemical Company
Analytical Results of Sediment Samples for Total Metals
October and November 1992

Concentrations in mg/Kg

Compound	E-8	E-9	E-10	E-11	E-12 D2	E-13	E-14
aluminum	31,400 J	31,800 J	19,600 J	20,200 J	19,400	5,030	9,630
antimony	ND	ND	ND	ND	ND	ND	ND
arsenic	294	27 3 J	1,660	177	32 1 J	12 6	5 0
barium	90 1 J	79 2 J	52 8 J	42 9 J	63 9 J	31 8 J	66 3
beryllium	ND	ND	ND	ND	ND	ND	ND
cadmium	3 0	ND	ND	ND	ND	3 6	ND
calcium	4,950	5,750	6,210 J	3,260 J	3,220	1,810 J	2,340
chromium	111 J	96 1 J	51 5 J	49 5 J	69 8 J	11 7	26 2
cobalt	14 1 J	13 4 J	ND	ND	11 0 J	11 9 J	8 8 J
copper	600 J	149 J	189 J	170 J	111 J	942	23 5
iron	52,100 J	39,800 J	133,000 J	244,000 J	26,200 J	10,800	11,500
lead	192	116 J	78 4 J	55 6 J	75 1	64 7	15 2
magnesium	13,400	12,700	8,890	6,790	8,920	665 J	3120
manganese	290 J	329 J	236 J	77 1 J	182 J	688 J	140 J
mercury	4 5	1 2	1 6	0 80	0 83	1 7 J	0 43 J
nickel	85 5	92 3	ND	ND	61 6	17 6 J	30 2 J
potassium	4,740 J	5,730 J	ND	ND	3,490 J	ND	1680
selenium	7 3	ND	5 7 J	ND	ND	7 2 J	ND
silver	ND	ND	ND	ND	ND	ND	ND
sodium	20,500	11,700 J	25,800 J	31,800 J	12,100 J	696 J	417 J
thallium	ND	ND	ND	ND	ND	ND	ND
vanadium	90 2	79 4	85 1	55 6	53 4	20 4 J	25 9
zinc	1,250 J	354 J	348 J	457 J	286 J	490	60 8

Notes:
J = The results are estimated and the data are valid for limited purposes; results are qualitatively acceptable.
D1, D2, D3 = Field Duplicate Pairs
BG = Background
ND = Not Detected
There are no health-based benchmarks for contaminants found in sediments

Table 4-8 (Cont.)

Stauffer Chemical Company
Analytical Results of Sediment Samples for Total Metals
October and November 1992

Concentrations in mg/Kg

Compound	E-15 D2	E-16 D1	E-17 BG	E-18 BG	E-19 BG	E-20 D3	E-21 D3
aluminum	20,700	12,500 J	27,200 J	39,400	7,860	50,800	62,400
antimony	ND	ND	ND	ND	ND	ND	ND
arsenic	12 3	60 1 J	14 6 J	17 0	6 3	67 0	52 6
barium	86 0	103 J	65 0 J	93 5 J	81 2	810	651
beryllium	ND	ND	ND	ND	ND	ND	3 4 J
cadmium	ND	ND	ND	ND	ND	14 6 J	ND
calcium	3,390	2,330 J	3,830	5,420	5,890	24,900	12,000
chromium	71 6	34 3 J	107 J	139	69 1	87 5	97 3
cobalt	10 6 J	ND	12 9 J	19 0 J	19 3	107	29 3 J
copper	116	816 J	87 2 J	106	11 3	1,930	104
iron	27,200	278,000 J	36,800 J	49,500	10,400	35,200	77,800
lead	75 1	84 1 J	157	165	15 4	210	202
magnesium	8,940	5,170	13,000	18,400	3,550	6,110 J	8,010 J
manganese	188 J	46 5 J	259 J	313 J	461 J	157,000	767
mercury	3 0 J	1 6	0 88	1 3 J	ND	2 8	2 3
nickel	56 2 J	ND	83 6	110 J	102 J	402	ND
potassium	3,500	31,400 J	5,390 J	7,910	ND	ND	ND
selenium	ND	4 5	ND	ND	ND	9 3 J	16 3 J
silver	ND	ND	ND	ND	ND	ND	ND
sodium	11,800	29,900 J	16,700 J	35,300	352 J	2,950 J	1,240 J
thallium	ND	ND	ND	ND	ND	ND	ND
vanadium	52 9	74 5	68 4	95 5	24 0	62 3 J	145
zinc	296	440 J	270 J	286	49 2	5,490	4,820

Notes.
J = The results are estimated and the data are valid for limited purposes, results are qualitatively acceptable
D1, D2, D3 = Field Duplicate Pairs
BG = Background
ND = Not Detected
There are no health-based benchmarks for contaminants found in sediments

Table 4-9

Stauffer Chemical Company
Analytical Results of Sediment Samples for PCB/Pesticides
October and November 1992

Concentrations in µg/Kg

Compound	E-1	E-2	E-3	E-4	E-5 D1	E-6	E-7
alpha-BHC	57	300	ND	ND	ND	200	5
beta-BHC	16	66	ND	ND	ND	46	2 J
delta-BHC	ND	ND	ND	ND	ND	70	2 J
gamma-BHC (Lindane)	11	14	ND	ND	ND	12	1 J
Aldrin	ND	ND	2	3 J	ND	ND	ND
Dieldrin	ND	ND	ND	3 J	ND	2 J	ND
4,4'-DDE	18	64	11	10	24	5 J	21
Endrin	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	44	87 J	12 J	14 J	140	35	180
4,4'-DDT	150	370	8	4 J	130	23	120
Methoxychlor	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	2 J	ND	ND	ND	2 J	ND	1 J
Endrin Aldehyde	ND	ND	ND	4 J	ND	ND	ND
alpha-Chlordane	3 J	9	3 J	4 J	6	2 J	4
gamma-Chlordane	6 J	11 J	3 J	5 J	9	0.9 J	2 J
Toxaphene	ND	250 J	ND	ND	ND	ND	ND
Arochlor-1248 (PCB)	160	ND	140	120 J	ND	ND	ND

Notes:
J = The results are estimated and the data are valid for limited purposes; results are qualitatively acceptable.
D1, D2, D3 = Field Duplicate Pairs
BG = Background
ND = Not Detected
--- = Not Available
There are no health-based benchmarks for contaminants found in sediments.

Table 4-9 (Cont.)

Stauffer Chemical Company Site
Analytical Results of Sediment Samples for PCB/Pesticides
October and November 1992

Concentrations in µg/Kg

Compound	E-8	E-9	E-10	E-11	E-12 D2	E-13	E-14
alpha-BHC	ND	ND	3 J	ND	ND	38 J	ND
beta-BHC	ND	ND	9 J	7 J	ND	20 J	ND
delta-BHC	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	1 J	10	ND
Dieldrin	37	ND	ND	ND	9 J	14	ND
4,4'-DDE	64	30	43 J	26	19	31	2 J
Endrin	13 J	19 J	ND	ND	ND	ND	ND
4,4'-DDD	170	80	78 J	58	46	76	1 J
4,4'-DDT	140	37 J	190	14 J	7	74	ND
Methoxychlor	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	ND	ND	ND	ND	ND	ND	ND
Endrin Aldehyde	17	18 J	ND	ND	2 J	ND	ND
alpha-Chlordane	24	15	7 J	4 J	10	ND	ND
gamma-Chlordane	13	7 J	6 J	6 J	9 J	ND	ND
Toxaphene	690 J	1,400 J	ND	ND	ND	ND	ND
Arochlor-1248 (PCB)	ND	ND	ND	ND	ND	ND	ND

Notes:
J = The results are estimated and the data are valid for limited purposes; results are qualitatively acceptable.
D1, D2, D3 = Field Duplicate Pairs
BG = Background
ND = Not Detected
--- = Not Available
There are no health-based benchmarks for contaminants found in sediments.

Table 4-9 (Cont.)

Stauffer Chemical Company
Analytical Results of Sediment Samples for PCB/Pesticides
October and November 1992

Concentrations in µg/Kg

Compound	E-15 D2	E-16 D1	E-17 BG	E-18 BG	E-19 BG	E-20 D3	E-21 D3
alpha-BHC	ND	ND	ND	ND	ND	ND	ND
beta-BHC	ND	ND	ND	ND	ND	ND	ND
delta-BHC	ND	ND	ND	ND	ND	4 J	39
gamma-BHC (Lindane)	ND	ND	0.8 J	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	ND	ND	ND
Dieldrin	10 J	ND	2 J	ND	2 J	ND	14 J
4,4'-DDE	36	23	6 J	5 J	1 J	86	120
Endrin	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	50	130	5 J	4 J	2 J	150	180
4,4'-DDT	54	120	2 J	ND	ND	33 J	32 J
Methoxychlor	ND	ND	ND	ND	ND	ND	ND
Endrin Ketone	ND	2 J	ND	ND	ND	ND	ND
Endrin Aldehyde	ND	ND	ND	ND	ND	ND	ND
alpha-Chlordane	13	5	2 J	2 J	1 J	7 J	5 J
gamma-Chlordane	14	7	4 J	2 J	1 J	6 J	10 J
Toxaphene	ND	ND	ND	ND	ND	ND	ND
Arochlor-1248 (PCB)	ND	ND	ND	ND	ND	ND	ND

Notes:
J = The results are estimated and the data are valid for limited purposes; results are qualitatively acceptable.
D1, D2, D3 = Field Duplicate Pairs
BG = Background
ND = Not Detected
--- = Not Available
There are no health-based benchmarks for contaminants found in sediments.

Table 4-10

Stauffer Chemical Company Site
Analytical Results of Sediment Samples for Organophorphorus Pesticides
October and November 1992

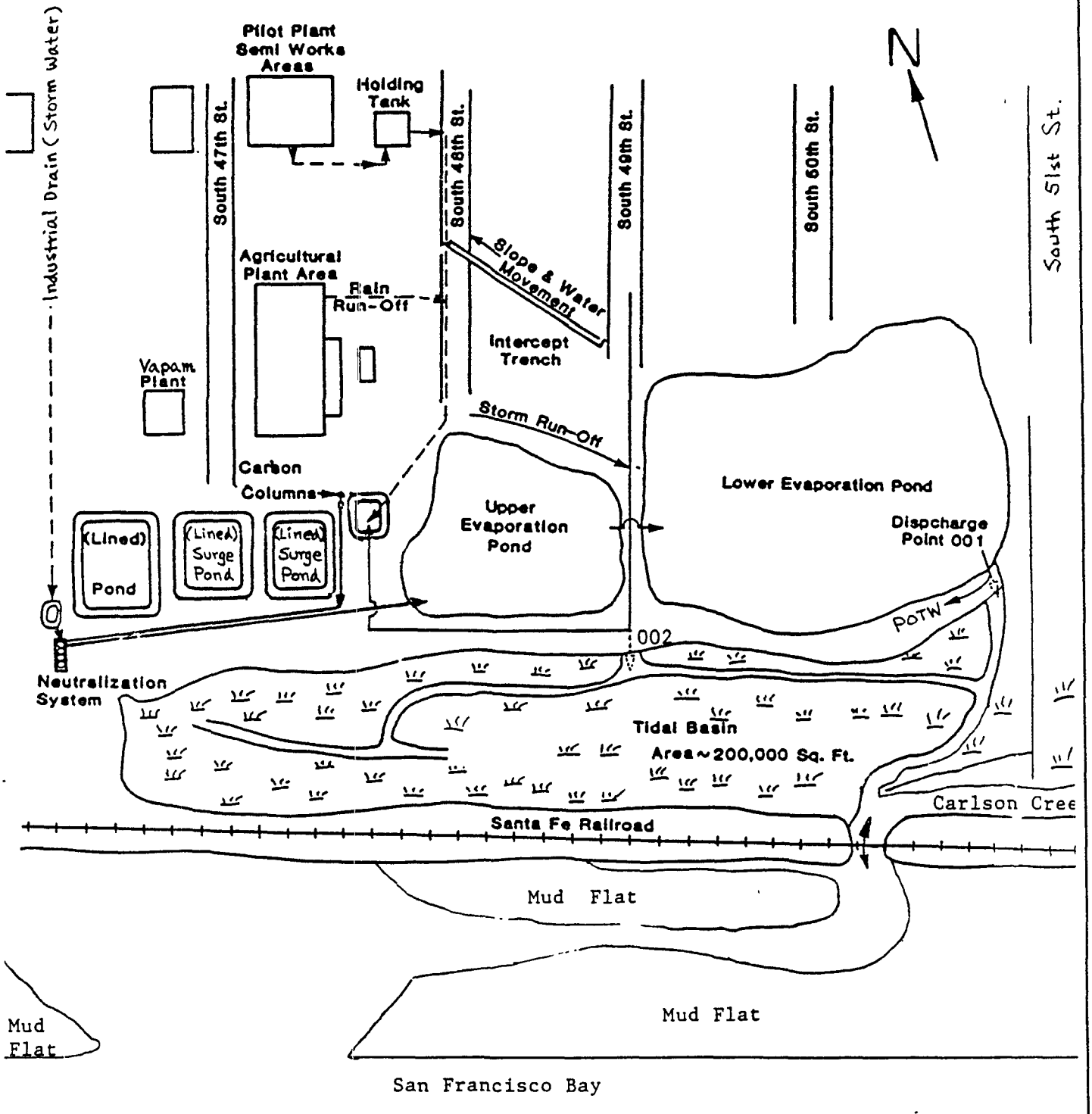
Concentrations in µg/Kg

Compound	E-1	E-2	E-3	E-4	E-5 D1	E-6	E-7
Dichlorvos	ND	ND	ND	ND	ND	ND	ND
TEPP (Tetraethyl Phosphate)	ND	ND	ND	ND	ND	ND	11

Compound	E-8	E-9	E-10	E-11	E-12 D2	E-13	E-14
Dichlorvos	ND	ND	ND	ND	ND	70 J	ND
TEPP (Tetraethyl Phosphate)	ND	ND	ND	ND	ND	370	ND

Compound	E-15 D2	E-16 D1	E-17 BG	E-18 BG	E-19 BG	E-20 D3	E-21 D3
Dichlorvos	ND	ND	ND	ND	ND	ND	ND
TEPP (Tetraethyl Phosphate)	ND	110 J	ND	ND	ND	ND	ND

Notes:
J = The results are estimated and the data are valid for limited purposes; results are qualitatively acceptable.
D1, D2, D3 = Field Duplicate Pairs
BG = Background
ND = Not Detected
There are no health-based benchmarks for contaminants found in sediments.



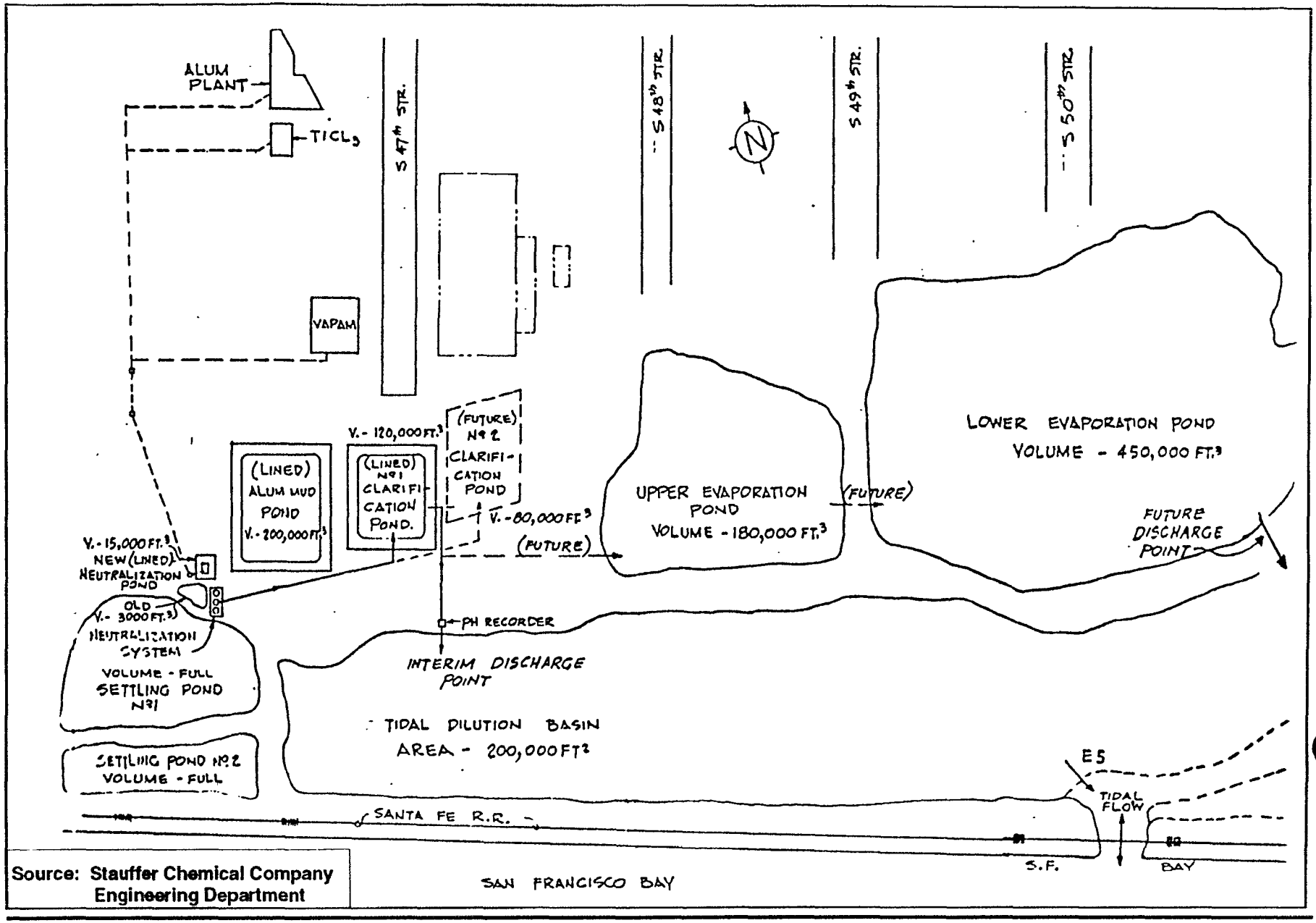
Source: ICI Americas Inc.

URS Consultants
100 California Street
San Francisco, CA 94111
January 7, 1993

Wastewater Treatment System

June, 1992
Stauffer Chemical Company
(ICI Americas)
Richmond, California

FIGURE
4-3



Source: Stauffer Chemical Company Engineering Department

URS Consultants
100 California Street
San Francisco, CA 94111
January 7, 1993

Wastewater Treatment System

June 17, 1972
Stauffer Chemical Company
(ICI Americas)
Richmond, California

FIGURE

4-4

ponds are used during storm events which exceed the activated carbon adsorption systems' capacity Water is re-directed to the surge ponds and run through the activated carbon adsorption system at a later date There has been no known overflow of the surge ponds since construction Sludge and water samples from one surge pond were collected and analyzed as part of the 1987 assessment of surface impoundments for TPCA Water samples collected were free of metals contamination However, sludge samples analyzed for total metals revealed arsenic up to 15 mg/Kg, cadmium up to 4 mg/Kg, chromium up to 12 6 mg/Kg, copper up to 456 mg/Kg, lead up to 134 mg/Kg, nickel up to 23 mg/Kg, selenium up to 24 mg/Kg, and zinc up to 832 mg/Kg (see Table 4-3) Additional analysis of sludge samples for soluble metals by WET revealed concentrations of fluoride up to 190 mg/L which is greater than the STLC of 180 mg/L (see Table 4-4) Water samples collected for analysis of priority pollutants by EPA Method 8020 revealed only 1,1-DCA at up to 3 µg/L (see Table 4-7) (13,31,32)

Hazardous Materials/Hazardous Waste Storage Areas

The operational nature of the ICI Americas plant requires the storage and use of hazardous materials and the generation of hazardous waste In a 1992 inventory of hazardous materials, a total of 121 hazardous substances were located on-site at the research center The average amount of hazardous materials and hazardous wastes located at the research center at any given time is approximately 29,845 pounds and 27,871 gallons The average amount of hazardous materials and hazardous wastes stored at the production plant at any given time is approximately 4,352,743 pounds Extremely hazardous waste manifests generated for the transportation of hazardous waste from the site indicate that as much as 110 gallons of DDT was removed from the site for disposal by burial in 1983 (15,23,24)

4.2 Groundwater Pathway

4.2.1 Hydrogeologic Setting

The site is located within the Department of Water Resources' (DWR) San Francisco Bay Hydrologic Study Area and within the Alameda Bay Plain Groundwater Basin Water-bearing surfical deposits within the Alameda Bay Plain consist generally of alluvial materials Throughout the Bay Area, these naturally placed water-bearing deposits (aquifers) are overlain and interlayered by the fine-grained sediments (Bay Mud aquitard materials) deposited by the San Francisco Bay The most recent of these bay marginal

aquitard sediments are identified as Bay Mud and probably extend from the existing Bay margin to about 4 miles into the Bay Surfical non-natural fill materials overlying the Bay Mud at the site are considered aquifer materials for the purposes of this report These deposits are primarily man-placed fill materials consisting of dredged materials, construction debris, or other debris used for industrial processes (11)

Bedrock beneath the site consists of Franciscan Formation rocks occurring at a depth of approximately 300 feet bgs. In general, Franciscan Formation rocks were eroded along faults and shear zones which characterize the San Francisco Area tectonic environment to the present Bay Basin. Quaternary surfical deposits (sediments) overlie the Franciscan Formation. These deposits are in turn overlain in the area by the more recent Bay Muds (11).

In general, the area in the vicinity of the site is geomorphologically a transition zone between an active alluvial fan deposition zone, which received sediments from the bedrock uplands to the east of the site via streams, and the tidal saltwater marsh estuarine environment characterized by the Hoffman Marsh located south of the site (11)

The uppermost aquifer at the Stauffer site occurs at approximately 6 to 9 feet bgs within the fill material. Groundwater flow in the uppermost aquifer is generally toward the south toward the tidal marsh and San Francisco Bay Monitoring wells penetrating the uppermost aquifer revealed water levels that rose 3 to 4 feet above first-encountered groundwater, indicating moderate artesian pressure or tidal influence on the aquifer A groundwater intercept system located on-site includes an intercept trench connected to a pumping system. This intercept system affects local groundwater flow Groundwater flow in the vicinity of the site may be tidally influenced Groundwater occurs at approximately 5 feet bgs at the site, which corresponds to an elevation of approximately -0.8 feet relative to mean sea level. Annual net precipitation in the vicinity of the Stauffer site is 10.86 inches (1,20,21,26).

4.2.2 Groundwater Targets

Groundwater use within 4 miles of the Stauffer site is limited to irrigation and industrial purposes. Several irrigation wells are located within 4 miles of the site Residents of Richmond, CA receive drinking water from imported water supplied by the East Bay Municipal Utilities District (EBMUD) (26).

4.2.3 Groundwater Pathway Conclusions

Groundwater beneath the site is contaminated with agricultural chemicals, toluene, and metals attributable to the Stauffer site. A remediation system has been in operation since 1988 to mitigate groundwater contaminated with agricultural chemicals (19,20,21,26).

4.3 Surface Water Pathway

4.3.1 Hydrologic Setting

Directly south and to the southwest of the Stauffer site is an unnamed tidal basin of San Francisco Bay. The tidal basin contains salt marshes, mud flats, and sloughs. Storm water runoff and wastewater have drained into this tidal basin through as many as five discharge points throughout the history of the site. The beneficial uses of San Francisco Bay and contiguous water bodies are water contact and non-contact recreation, wildlife and estuarine habitat, habitat for rare and endangered species, commercial and sport fishing, shellfish harvesting, navigation, and industrial service and process supply (1,9).

Carlson Creek, which originates in the hills east of the site and drains into the tidal marsh adjacent to the Stauffer site, runs along the eastern boundary of the site. Two evaporation ponds, described in Section 4.1, are located near the south-eastern boundary of the site. The maximum 2-year, 24-hour rainfall for the site is 2.5 inches. The majority of the site is above the 500-year flood plain; however, areas near the southern portion of the site, including the wastewater treatment ponds and the cinder landfill, are in the 10-, 50-, and 100-year flood plains (1,34,38).

4.3.2 Surface Water Targets

The primary receptors of contaminants associated with the Stauffer site are wetlands and sensitive species. The Stauffer site is situated adjacent to two tidal marshes that provide habitat for several federally protected species (see Table 4-11). The on-site evaporation ponds are used as habitat for several species listed in Table 4-11. During the sampling event on October 23, 1992, a California black rail (*Laterallus jamaicensis coturniculus*) was observed by a URS representative and confirmed by an EPA ecologist present at the time of the observation in evaporation pond 1 (25,33).

Other potential receptors of contaminants associated with the Stauffer site include the San Francisco Bay fishery. San Francisco Bay and the sloughs within the tidal marshes

adjacent to the site are fisheries used for commercial and recreational fishing Fishermen were observed catching fish (for consumption purposes) within the sloughs of the tidal marsh adjacent to the Stauffer site (9)

Table 4-11
Potential Sensitive Species Near Stauffer Chemical Company Site

Species	Scientific Name	Federal Status
California black rail	*Laterallus jamaicensis coturniculus*	Category 1*
California clapper rail	*Rallus longirostris obsoletus*	Endangered
California least tern	*Sterna antillarum browni*	Endangered
tidewater goby	*Eucyclogobius newberryi*	Category 2**
salt marsh harvest mouse	*Reithrodontomys raviventris*	Endangered
salt marsh wandering shrew	*Sorex vagrans halicoetes*	Category 1
San Pablo vole	*Microtus californicus sanpabloensis*	Category 1
San Francisco forktail damselfly	*Ischnura gemina*	Category 2
Point Reyes bird's beak	*Cordylanthus maritimus palustris*	Category 2
mimic tryonia	*Tryonia imitator*	Category 2
California brown pelican	*Pelecanus occidentalis californicus*	Endangered

Notes:

*Category 1 = proposed federal threatened or endangered species

**Category 2 = species under review as to its federal endangered or threatened status

The San Francisco Bay is protected under the State Coastal Zone Management Plan because of its ecological and economic value. A proposal to include the San Francisco Bay in the National Estuary Program Study area is currently being developed (36)

4.3.3 Surface Water Pathway Conclusions

The surface water pathway is the primary pathway of concern at the Stauffer site Sediment samples collected by URS from the tidal marsh and evaporation ponds revealed elevated levels of arsenic, cadmium, copper, lead, mercury, zinc, a-BHC, b-BHC,

d-BHC, Lindane, Aldrin, Dieldrin, DDE, DDD, DDT, Endrin, Endrin ketone, Endrin aldehyde, alpha-Chlordane, gamma-Chlordane, Toxaphene, and Arochlor-1248. Contaminants found in cinder landfill wastes and evaporation pond sediments include arsenic, cadmium, copper, mercury, zinc, a-BHC, b-BHC, d-BHC, Lindane, Dieldrin, DDE, DDD, DDT, Endrin ketone, Endrin aldehyde, alpha-Chlordane, gamma-Chlordane, and Arochlor-1248 (see Tables 4-8 and 4-9). The presence of the same contaminants in the cinder landfill and tidal marsh sediments suggests that contaminants have migrated to surface water bodies from sources at the Stauffer site. In addition, acidic conditions were documented in the tidal marsh water at sediment sample locations during the URS sampling event at the Stauffer site (see Table 4-12). Contaminants found in sediment samples may impact the habitat of several federally protected species and individuals fishing in the vicinity of the site (see Table 4-11).

4.4 Soil Exposure and Air Pathways

4.4.1 Physical Conditions

The Stauffer facility is located in an industrial/commercial area of Richmond, California. The closest residential area is located within 0.25 miles to the west northwest of the site. Although the majority of the site is unpaved, there are several paved roadways and buildings on the Stauffer property. There have been several chemical spills during the 84 years of operation by Stauffer. ICI Americas currently holds two source permits from the BAAQMD (1,9).

With the exception of the southern boundary of the site along the tidal marsh, the site is fenced and guarded 24 hours a day. The site is 75 acres in size and generally flat (2).

4.4.2 Soil and Air Targets

There are approximately 400 employees working for ICI Americas at the Stauffer site. URS estimates that between 1 and 100 employees may come in contact with areas of surface soil contamination. Table 4-13 is an estimate of the population within 4 miles of the site based on 1980 census data and reconnaissance observations. Residential population within 1 mile of the Stauffer site according to 1980 census data is 9,198 people (35). Based on observations made during the URS reconnaissance visit during the sampling event, it was estimated that 400 people live in a new housing development between 0 and 0.25 miles from the site; additionally, it is estimated that 1,000 people live in this new development between 0.25 and 0.50 miles from the site (2).

There are several sensitive species within 4 miles of the Stauffer site (see Table 4-11). There are approximately 85 acres of salt marsh wetlands within 4 miles of the Stauffer site. The San Francisco Bay Trail runs along the former railroad tracks near the southern border of the site. The Bay Trail is a regional trail heavily used for recreation. Areas along the southern portion of the Stauffer site (sampling location S-3 and S-4) are easily accessed from the Bay Trail (1,2,33).

Table 4-12
pH/Conductivity Measurement Values at Stauffer Chemical Company Site*
October and November 1992

Sediment Sample Location	pH	Conductivity
E-1	2.96	24,800
E-2	4.92	2,860
E-3	6.52	1,140
E-4	6.82	37,700
E-5	3.22	42,500
E-6	3.20	17,500
E-7	2.85	9,340
E-8	6.22	11,520
E-9	6.37	24,700
E-10	5.88	25,920
E-11	5.92	34,900
E-12	6.23	410
E-13	6.56	2,010
E-14	6.69	1,920
E-17	7.03	23,520
E-18	6.25	42,300
E-19	7.35	870
E-20	6.78	1260

Notes:

* pH and conductivity measurements were obtained from recharge water in each sediment sampling hole.

Table 4-13
Approximate Population within 4 miles of Stauffer

Distance from site (miles)	Population
0 to 0.25	800 (employee pop. included)
0.25 to 0.5	1,000
0.5 to 1	9,198
1 to 2	40,116
2 to 3	59,862
3 to 4	54,713
Total	165,689

4.4.3 Soil Exposure and Air Pathway Conclusions

Soil in the cinder landfill has been shown to be contaminated with metals and pesticides within 2 feet of the ground surface. Soil sample S-2 was collected from a fenced in area inaccessible to the general public. Soil samples S-3 and S-4 were collected from 1.5 feet bgs in an area accessible to the general public where a sediment pond previously used by Stauffer existed. Soil sample S-1 was collected along a trail near the tidal marsh accessible to the public. Soil samples collected from area accessible to the general public revealed contamination at levels greater than three times background concentrations. Contaminants in these surface soil samples include mercury up to 0.13 mg/Kg, Dieldrin up to 3.4 µg/Kg, DDE up to 2.7 µg/Kg, DDD up to 10 µg/Kg, DDT up to 19 µg/Kg, Endrin ketone up to 1.9 µg/Kg, alpha-Chlordane up to 1.5 µg/Kg, and gamma-Chlordane up to 2.5 µg/Kg (see Tables 4-1 and 4-2).

5.0 Emergency Response Considerations

The National Contingency Plan [40 CFR 300.415 (b) (2)] authorizes the Environmental Protection Agency to consider emergency response actions at those sites which pose an imminent threat to human health or the environment. URS contacted Mr. Terry Brubaker, Section Chief of the U.S. EPA Emergency Response Section on December 15, 1992 regarding the Stauffer site. After discussing site conditions with Mr. Brubaker it was determined that emergency response at this site is not appropriate at this time. URS forwarded preliminary analytical results and pH measurement readings to Mr. Brubaker.

6.0 Summary

In 1897, Stauffer purchased the 75-acre site and had begun chemical production operations by 1906 Stauffer produced a variety of industrial and agricultural chemicals until 1985 In March 1985, Chesebrough-Ponds merged with Stauffer In December 1986 several Chesebrough-Ponds divisions, including Stauffer, were purchased by the Unilever Corporation In 1990, Imperial Chemical Industries, Americas (ICI Americas) purchased the site, and it is the current site owner and operator

Stauffer manufactured, formulated, and bulk loaded agricultural chemicals Chemicals manufactured by Stauffer include sulfuric acid, aluminum sulfate, titanium trichlorate, Vapam, and Devrinol Chemicals formulated by Stauffer include Betasan, Captam, Devrinol, Eptam, Ordram, Ro-Neet, Tillan, and Trithion Chemicals bulk loaded by Stauffer include caustic soda, hydrochloric acid, hydrofluosillic acid, tetrachloroethylene (PCE), carbon disulfide, Sutan, Silbond, and Silbond-40 Trithion is the only formulated organophosphate pesticide manufactured at the facility, all other formulated chemicals are thiocarbamates pesticides Extremely hazardous waste manifests reveal that Stauffer disposed of 4,4-dichlorodiphenyl trichloroethane (DDT) The origin of polychlorinated biphenyls (Aroclor-1248) found in soil and sediment samples collected during the URS sampling event is unkriown

The surface water pathway is the primary pathway of concern at the Stauffer site Elevated levels of arsenic, cadmium, copper, lead, mercury, zinc, alpha-hexachlorocyclohexane (a-BHC), beta-hexachlorocyclohexane (b-BHC), delta-hexachlorocyclohexane (d-BHC), gamma-hexachlorocyclohexane (Lindane), aldrin epoxide (Dieldrin), p,p-dichlorodiphenyl dichloroethlyene (DDE), dichlorodiphenyl dichloroethane (DDD), DDT, Endrin, Endrin ketone, Endrin aldehyde, alpha-Chlordane, gamma-Chlordane, Toxaphene, and Arochlor-1248 have been found in sediments adjacent to the Stauffer site Contaminants found in on-site waste management source areas include arsenic, cadmium, copper, mercury, zinc, a-BHC, b-BHC, d-BHC, Lindane, Dieldrin, DDE, DDD, DDT, endrin ketone, endrin aldehyde, alpha-Chlordane, gamma-Chlordane, and Arochlor-1248 The correlation of contaminants detected in on-site waste management sources and sediment samples from the adjacent tidal marsh indicate that contaminants have migrated to surface water bodies from sources at the Stauffer site Contaminants found in sediment samples are uncontained and are available to impact

several federally protected species and people fishing in the tidal marsh adjacent to the site

The California Regional Water Quality Control Board (RWQCB) is the lead agency at the site RWQCB has been involved in National Pollutant Discharge Elimination System permitting and compliance issues, leaking underground storage tank investigations and remediation, Toxic Pits Cleanup Act assessments of sedimentation and evaporation ponds, and a Solid Waste Assessment Test of the cinder landfill

The following are pertinent Hazard Ranking System (HRS) factors associated with the site

- There has been a documented release of toluene, agricultural chemicals and metals to groundwater beneath and attributable to the Stauffer site
- Groundwater in the vicinity of the site is used for irrigation and industrial purposes
- There has been a documented release of contaminants to soils within 2 feet of the ground surface attributable to the Stauffer site
- Areas of contaminated surface soil are accessible to residents and recreational users of areas near the site
- The residential population within 1 mile of the Stauffer site based on 1980 census data is estimated at 9,198
- There has been a documented release of contaminants attributable to the Stauffer site to surface water sediments located in an adjacent tidal marsh area and to on-site evaporation ponds
- Tidal marsh areas and on-site ponds provide habitat for up to 10 federally protected species One federally protected species, the California black rail, was observed on-site during sampling activities conducted on October 26, 1992
- There is a large hazardous waste quantity associated with current and past hazardous waste management sources at the Stauffer site

REMEDIAL SITE ASSESSMENT DECISION - EPA REGION IX

Site Name: Stauffer Chemical Company **EPA ID #:** CAD009123456

Alias Site Names: ICI Americas

City: Richmond **County or Parish:** Contra Costa **State:** CA

Refer to Report Dated: July 14, 1994 **Report Type:** Site Inspection

Report developed by: URS Consultants, Inc.

DECISION:

☐ **1. Further Remedial Site Assessment under CERCLA (Superfund) is not required because:**

☐ 1a. Site does not qualify for further remedial site assessment under CERCLA (Site Evaluation Accomplished - SEA)

☐ 1b. Site may qualify for further action, but is deferred to: ☐ RCRA ☐ NRC

☒ **2. Further Assessment Needed Under CERCLA**

2a. (optional) Priority: ☒ Higher ☐ Lower

2b. Activity Type ☐ PA ☐ ESI ☐ SI ☒ HRS evaluation

☐ Other_____

DISCUSSION/RATIONALE:

Significant soil, groundwater, and sediment contamination. Migration to adjacent tidal marsh.

Report Reviewed and Approved by: J.M. Johnson **Signature:** J.M. Johnson **Date:** 9.12.94

Site Decision Made by: J.M. Johnson **Signature:** J.M. Johnson **Date:** 9.12.94

8.0 References

1. U S Geological Survey, 7 5-minute topographic map of Richmond, California, 1959 (photorevised in 1980)

2 Fields, Kevin, Marita McLaughlin, and John Riley, ICI Americas, Inc , and John P Zwierzycki and Kenyon A Larsen, URS Consultants, Inc , *Site Reconnaissance Interview and Observations Report*, June 9, 1992

3 Regional Water Quality Control Board, *Executive Officer Summary Report*, June 18, 1986

4 Braufman, Arthur, Stauffer Chemical Company, to Joanne Cox, California Regional Water Quality Control Board, letter re treatment system bypass incidents, March 13, 1986

5 Singer, Harold, Regional Water Quality Control Board, to David Selph Stauffer Chemical Company, letter re treatment system bypass incidents, March 31 1986

6 Stauffer Chemical Company, *Waste Discharge Report*, June 18, 1972

7 California Department of Fish and Game, News release, January 22, 1960

8 California Department of Health Services, *Abandoned Site Project, Site Information Summary, Stauffer Chemical Company*, August 1981

9 Phalen, Kathleen, *Recommendations for Further Action*, ICF Technology Inc , May 21, 1987

10 Diridoni, Julia, *Reassessment of Stauffer Chemical Company*, ICF Technology Inc , May 9, 1988

11 Kennedy, Jenks, Chilton, *Final Remedial Investigation Report, Liquid Gold Site*, Richmond, California December 1990

12 Anatec Laboratories Inc , *Sampling and Analysis of Plant Evaporation Ponds 1 and 2 at the Richmond Agricultural Plant for ICI Americas*, March 29, 1988

13 Stauffer Chemical Company, *Assessment of Surface Impoundments at ICI Americas, Richmond, California for TPCA*, November 2, 1987

14 Mark Group, *Report of Closure Certification, Agricultural Yard Pond, ICI Americas Inc* , December 31, 1991

15 California Environmental Protection Agency, Department of Toxic Substances Control, California Extremely Hazardous Waste Permit, August 15, 1983

16 ICF Technology Inc , *Reassessment of Blair Southern Pacific Landfill*, February 22, 1988

17. ICF Consulting Associates, Inc., *Recommendations for Further Action, Blair Southern Pacific Landfill,* January 29, 1987.

18. U.S. Environmental Protection Agency, Geographic Information System (GIS) database, printout for Stauffer Chemical Company Site, July 10, 1992.

19. Mark Group, *Solid Waste Assessment Test of the Cinder Landfill,* 1991.

20. Mark Group, *Removal of Underground Storage Tanks at ICI Americas' Agricultural Products Plant in Richmond, California,* August 21, 1991.

21. ICI Americas, Inc., *Update Report on Groundwater Intercept System,* October 31, 1990.

22. California Regional Water Quality Control Board, *Executive Officer Summary Report*, January 16, 1990.

23. ICI Americas, Inc., Hazardous Material Business Plan Program for the Agricultural Products Plant, February 26, 1992.

24. ICI Americas, Inc., Hazardous Material Business Plan Program for the Research Center, July 1992.

25. Williams, Matthew, *Screening Site Inspection Reassessment of the Richmond Field Station,* Ecology and Environment, Inc., February 16, 1990.

26. California Department of Transportation, *Groundwater Investigation for the Richmond Semi-Depressed Section,* September 1978.

27. Regional Water Quality Control Board, *Executive Officer Summary Report,* July 17, 1985.

28. Regional Water Quality Control Board, *Executive Officer Summary Report,* June 18, 1985.

29. Anatec, *Biological Results of Benthic and Plankton Samples Taken at Evaporation Ponds 1 and 2,* April 17, 1986.

30. Forbes Magazine, *Good Chemistry*, December 11, 1978.

31. Riley, John, ICI Americas, Inc., to Rachel Loftin, U.S. Environmental Protection Agency Region IX, letter re: current wastewater disposal system and site conditions, July 22, 1992.

32. U.S. Environmental Protection Agency, Superfund Chemical Data Matrix, Appendix B, October 6, 1992.

33. California Department of Fish and Game, Endangered Species: Natural Diversity Database, 1991.

34. U.S. Department of Commerce, NOAA, National Weather Service, NOAA Atlas II, *Precipitation-Frequency Atlas of the Western United States*, Volume XI-California, P. 37, Silver Springs Maryland, 1973.

35. U.S. Environmental Protection Agency, Office of Toxic Substances, Graphical Exposure Modeling System (GEMS), August 1989

36 Travis, William, Bay Conservation Development Commission, and John Zwierzycki URS Consultants, Inc , telephone conversation, July 14, 1992

37 Walker, Rochelle, Bay Area Air Quality Management District, and John Zwierzycki, URS Consultants, Inc , telephone conversation, April 22, 1992

38. Firth, Bill, Army Corps of Engineers, and John Zwierzycki, URS Consultants, Inc , telephone conversation, April 23, 1992

39. Pacific Aerial Surveys, Aerial Photograph number AV-1100-070-10, April 18, 1973

40. Pacific Aerial Surveys, Aerial Photograph number AV-3845-5-10, June 12, 1990

41. Pacific Aerial Surveys, Aerial Photograph number AV-119-06-13, August 15, 1953

42. Hazardous Waste Surveillance and Compliance Report, California Department of Health Services (now CAL EPA DTSC), January 25, 1983

43. Regional Water Quality Control Board, Spill/Complaint Record, November 1972

44. Regional Water Quality Control Board, Executive Officer Summary Report, February 27, 1973

45 Regional Water Quality Control Board, Amending Waste Discharge Requirements for Stauffer Chemical Company Richmond Plant, October 1984

46 Regional Water Quality Control Board, Spill/Complaint Record, November 4, 1968

47 Regional Water Quality Control Board, Spill/Complaint Record, April 18, 1963

48. Anatec Laboratories Inc , *Sediment Bioassay Using Lumbriculus Variegatus*, January 19, 1987.

49 Richmond Aquatic Toxicology Laboratory, *Chronic In Situ Bioassay of Bluegill Sunfish (Lepomis macrochirus) in Stauffer Chemical Company Richmond Plant Evaporation Ponds*, February 2, 1987

50. Wildlife International Ltd , Pond Sediments EP-1 and EP-2 An Acute Oral Toxicity Study with the Mallard, January 5, 1987

51. SRI International, *Field Survey of Evaporation Ponds and Receiving Water Slough at the Stauffer Facility*, October 24, 1985

52 Trotter, Angie, Senior Clerk, Contra Costa County Assessors Office, and John Zwierzycki, URS, telephone conversation, April 30, 1992.

53. Mark Group, *Report of Removal of Underground Storage Tanks, Richmond Agricultural Products Plant , Richmond, California*, October, 1991

Appendix A
Contact Log and Reports

Contact Log

Facility Name: Stauffer Chemical Company
Facility ID #: CAD009123456

Contact	Affiliation	Phone #	Date	Information
Rebecca Balanesi	Contra Costa County Environmental Health	(510) 374-3141	3/9/92	No drinking water wells are located in Richmond, CA Drinking water is supplied by East Bay Municipal Utilities District
Doris Cruz	California Environmental Protection Agency Department of Toxic Substances Control (Cal EPA DTSC)	(510) 540-3800	4/9/92	Ms. Cruz told URS that a request should be faxed to her regarding file information, including site name and address
Jeri Rosner	Contra Costa County Occupational Health Hazardous Materials/Toxics Division	(510) 646-2286	4/9/92	Ms Rosner told URS that extensive files were available for ICI Americas (formerly Stauffer Chemical)
Rochelle Walker	Bay Area Air Quality Management District (BAAQMD)	(415) 749-4784	4/22/92	Ms Walker informed URS that ICI Americas currently holds permits for two incinerators and that an extensive site file is available.
Bill Firth	Army Corps of Engineers	(415) 744-3360	4/23/92	See Contact Report
Angie Trotter	Contra Costa County Assessors Office	(510) 313-7400	4/30/92	Ms. Trotter is the Senior Clerk at the Assessors Office. Ms Trotter stated that ICI Americas owns three parcels near the foot of 51st Street All other property in the vicinity is owned by the State of California.

Contact Log (cont.)

Facility Name: Stauffer Chemical Company
Facility ID #: CAD009123456

Contact	Affiliation	Phone #	Date	Information
Emmanuel Okeroeke	California Regional Water Quality Control Board - San Francisco Bay Region	(510) 464-0618	6/16/92	An extensive file is available on ICI Americas and Stauffer Chemical. This file includes a Solid Waste Assessment Test report completed on a landfill area, underground storage tank information, and information regarding the alum mud pond.
Alan Friedman	California Regional Water Quality Control Board San Francisco Bay Region	(510) 464-0618	6/16/92	Mr. Friedman told URS that detectable levels of herbicides and heavy metals have been found in wastewater discharged from the Stauffer site into the unnamed tidal marsh.
Michelle McKibben	Cal EPA DTSC	(916) 255-2123	6/23/92	Ms. McKibben told URS that Stauffer Chemical was referred to the Regional Water Quality Control Board on April 24, 1987, and the site no longer has State Superfund Status.
John Riley	ICI Americas, Inc.	(510) 231-1328	6/23/92	Mr. Riley told URS that the carbon column treatment of wastewater became operational at the beginning of the first quarter of 1974.
William Travis Deputy Director	Bay Conservation Development Commission	(415) 557-3686	7/14/92	See Contact Report.

Contact Log (cont.)

Facility Name: Stauffer Chemical Company
Facility ID #: CAD009123456

Contact	Affiliation	Phone #	Date	Information
John Vanbraan	Former contractor for Stauffer Chemical	FX-6 Personal Privacy	10/20/92	Mr. Vanbraan was contracted to assist in an excavation at Stauffer. During the excavation, many different colored soil layers were encountered. Mr. Vanbraan stated that he was overcome by fumes from the excavation and became ill.
Terry Brubaker	U.S. Environmental Protection Agency	(415) 744-2293	12/15/92	See Contact Report.
Harley Thompson Inspector	Richmond Fire Department	(510) 307-8031	12/16/92	The Richmond Fire Department has no information on historical plant operations for the Stauffer site.

URS Consultants
Environmental Protection Agency
Site Assessment Program

Contact Report

Contact Made Concerning: **CAD009123456**

Stauffer Chemical
1415 S. 47th Street
Richmond, California 94804
County of Contra Costa

Agency or Affiliation Contact: **Army Corps of Engineers**
Department: Water Resources Branch
Address: 211 Main Street
City, State, Zipcode: San Francisco CA
County: San Francisco

Representative Contact:
1. 2. 3.
Name: Bill Firth
Title: Hydraulic Engineer
Contact Phone Number: (415) 744-3360
Contact Date: 4/23/92
Contact Facsimile Number: (415) 744-3312

Contacted by URS Representative: John P. Zwierzycki

Discussion:

Mr. Bill Firth was contacted regarding information on floodplains in the city of Richmond. Mr. Firth stated that the 10-year floodplain is at 5.6 feet above mean sea level (msl), the 50-year floodplain is at 6.0 feet msl, the 100-year floodplain is at 6.1 feet msl, and the 500-year floodplain is at 6.4 feet msl.

End Contact Report

This contact report was sent for confirmation by: ☐ Letter ☐ Phone ☐ Fax ☐ Other _____

This contact report was reviewed by: _____
(Signature and Date)

URS Consultants
Environmental Protection Agency
Site Assessment Program

Contact Report

Contact Made Concerning: **CAD009123456**
Stauffer Chemical
1415 S. 47th Street
Richmond, California 94804

Agency or Affiliation Contact: **Bay Conservation Development Commission**
Department:
Address: 30 Van Ness Ave.
City, State, Zipcode: San Francisco CA 94111
County: San Francisco

Representative Contact:
1. 2. 3.
Name: Mr. William Travis
Title: Deputy Director
Contact Phone Number: (415) 557-3686
Contact Date: 7/14/92
Contact Facsimile Number:

Contacted by URS Representative: John P. Zwierzycki

Discussion:

Mr. Travis informed URS that the entire San Francisco/San Pablo/San Leandro Bay (The Bay) is considered protected under the State Coastal Zone Management Plan because of its ecological value.

San Francisco State University is currently working on a proposal to include The Bay in the National Estuary Program study area. Areas now in the National Estuary Program study area include Elkhorn Slough, near Monterey California, and the mouth of the Tijuana River in southern California.

Mr. Travis also said that the State Coastal Zone Management Plan defines the entire California coast as an area in need of protection because of its ecological value.

End Contact Report

This contact report was sent for confirmation by: ☐ Letter ☐ Phone ☐ Fax ☐ Other _____

This contact report was reviewed by: _____
(Signature and Date)

URS Consultants
Environmental Protection Agency
Site Assessment Program

Contact Report

Contact Made Concerning:	**CAD009123456** **Stauffer Chemical (aka ICI Americas)** 1415 South 47th Street Richmond, California 94804
Agency or Affiliation Contact:	**Environmental Protection Agency**
Department:	Emergency Response Section H-8-3
Address:	75 Hawthorne
City, State, Zipcode:	San Francisco CA 94105
County:	San Francisco

Representative Contact:

	1.	2.	3.
Name:	Terry Brubaker		
Title:	Section Chief		
Contact Phone Number:	(415) 744-2293		
Contact Date:	12/15/92		
Contact Facsimile Number:			

Contacted by URS Representative: John Zwierzycki/Bill Ritthaler

Discussion:

Terry Brubaker was contacted regarding emergency response considerations at the former Stauffer Chemical Company plant in Richmond. Contaminant levels found in sediment samples were discussed. Contaminant concentrations in sediments include Dieldrin - 37 parts per billion (ppb), 4,4-dichlorodiphenyl trichloroethane (DDT) - 370 ppb, Lindane - 14 ppb, Alpha-BHC - 300 ppb, Arochlor 1248 - 16 ppb, arsenic - 1660 parts per million (ppm), cadmium - 4.1 ppm, copper - 942 ppm, lead - 563 ppm, and mercury - 10.9 ppm. Contaminant concentrations found in soils were generally higher then sediment concentrations. Many of these compounds are persistent and bioaccumulative, and several people were seen fishing for bottom dwelling fish in the area. Mr. Brubaker stated that contaminants in these concentrations were generally not cause for emergency response actions; additionally, Mr. Brubaker felt that any actions taken to halt fishing in the area would be difficult to enforce. Unvalidated data will be forwarded to Mr. Brubaker for review. Mr. Brubaker suggested that we contact the Department of Fish and Game and the California Environmental Protection Agency Department of Toxic Substances Control to determine if any fish tissue sampling has been conducted in that area.

End Contact Report

This contact report was sent for confirmation by: ☑ Letter ☐ Phone ☐ Fax ☐ Other

This contact report was reviewed by: 5/19/93
(Signature and Date)

Appendix B
Site Reconnaissance Interview and Observations Report

URS Consultants
Environmental Protection Agency
Site Assessment Program

Site Reconnaissance
Interview and Observation Report

Site Information CAD009123456

Name:	**Stauffer Chemical**
Address:	1415 S. 47th Street
City, State, Zip Code:	Richmond, California 94804
Phone Number:	(510) 231-1328
Contact Name:	Mr. John Riley
Date of Site Visit:	6/9/92
URS Site Visit Team:	Kenyon A. Larsen John P. Zwierzycki

Site Representatives

Name :		*Title*
	John E. Riley	Plant Manager
	Kevin Fields	Former Plant Manager
	Marita McLaughlin	Attorney

Comments and Observations

Information gathered during the interview with John Riley, Kevin Fields, and Marita McLaughlin on 6/9/92:

The ICI Americas (ICI) facility is used to manufacture, formulate, and distribute chemical products. The 75-acre site contains areas devoted to research, process technology, engineering services, and production of agricultural chemicals.

The property was bought by the Stauffer Chemical Corporation (Stauffer) in 1897. Stauffer began chemical production operations in 1906. Stauffer manufactured agricultural and industrial chemicals. In 1986, Stauffer sold the site to Chesebrough-Ponds Corporation. The Chesebrough-Ponds Corporation, in turn, sold the site to the Unilever Corporation, and in 1990 the site was purchased by ICI.

Vapam is the only product currently manufactured at the site. Products currently formulated at the site include Ordram and Devrinol. Products produced by Stauffer at the site included, but were not limited to, sulfuric acid and aluminum sulfate. Aluminum sulfate production was discontinued by Stauffer in 1984.

Prior to 1987, storm runoff and wastewater were discharged to an adjacent tidal marsh after being run through carbon adsorption columns. The carbon adsorption columns remove residual organic contamination from the water. Since that time, wastewater has been directed to the Richmond Publicly Owned Treatment Works (POTW). ICI currently has approximately 4,000,000 gallons of surge capacity available in four retention ponds in case of heavy rains. These retention ponds were relined between 1989 and 1990. In the event of a heavy storm, if the 4,000,000-gallon surge capacity is exceeded, water would then be discharged to the tidal marsh. Wastewater has been run through carbon adsorption columns since 1974 to remove residual organic contaminants. Prior to 1974, wastewater was not treated for organic constituents prior to being released to the tidal marsh.

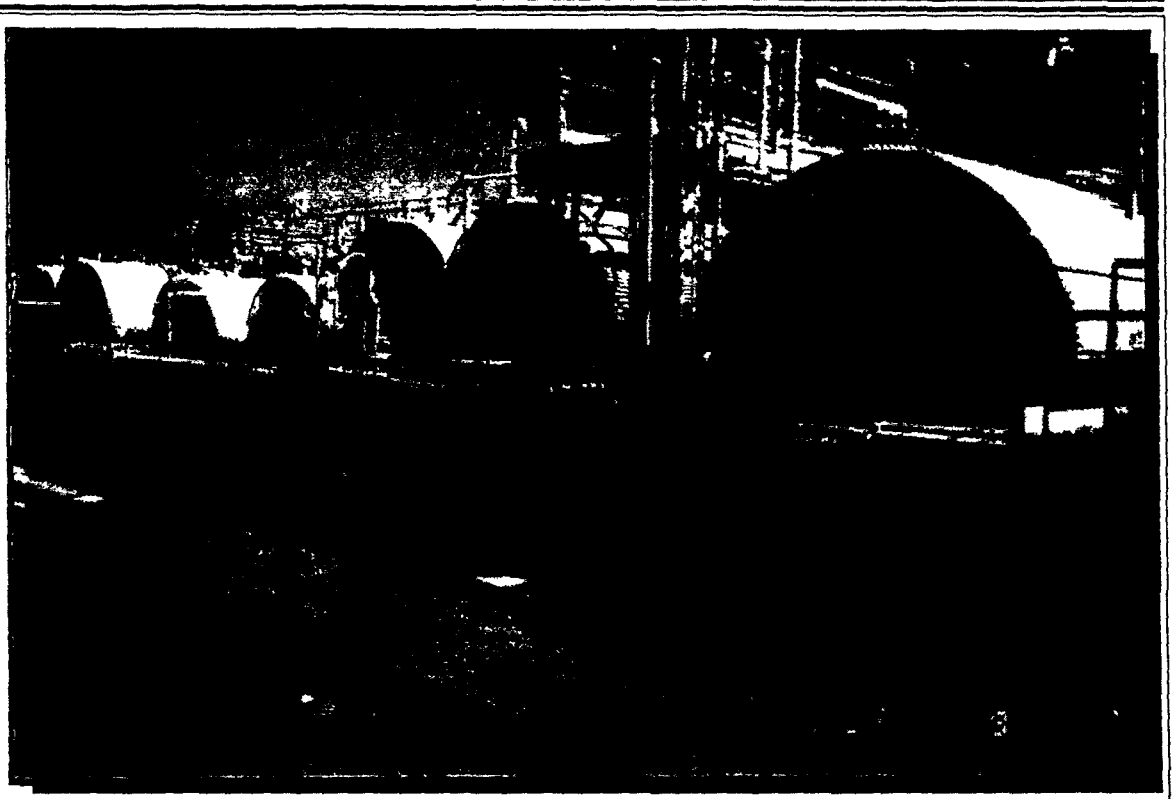
Appendix C
Photo Log

URS Consultants
100 California Street, Suite 500
San Francisco, CA 94111

FIELD PHOTOGRAPHY LOG SHEET

CAD009123456
Stauffer Chemical
1415 S. 47th Street
Richmond, CA

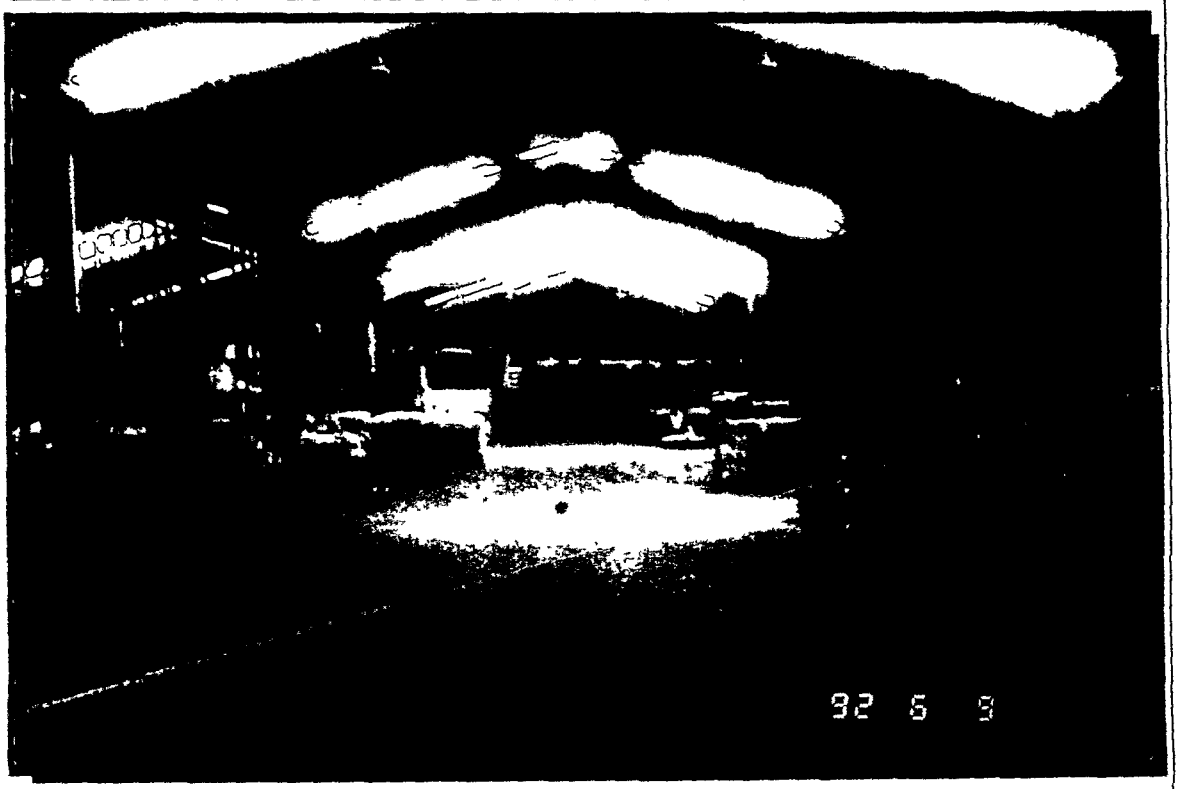
Photo No: 1
Date: 9/6/92
Time: 14:45
Direction: Southeast
Weather: clear
Photo by: Zwierzycki



Photograph Description: Tank complex used in the batch processing of thiocarbamate pesticides Railroad spur is adjacent to tank complex

CAD009123456
Stauffer Chemical
1415 S. 47th Street
Richmond, California

Photo No: 2
Date: 9/6/92
Time: 14:40
Direction: South
Weather: clear
Photo by: Zwierzycki



Photograph Description: Interior of warehouse used for distribution of agricultural and industrial chemicals

URS Consultants
100 California Street, Suite 500
San Francisco, CA 94111

FIELD PHOTOGRAPHY LOG SHEET

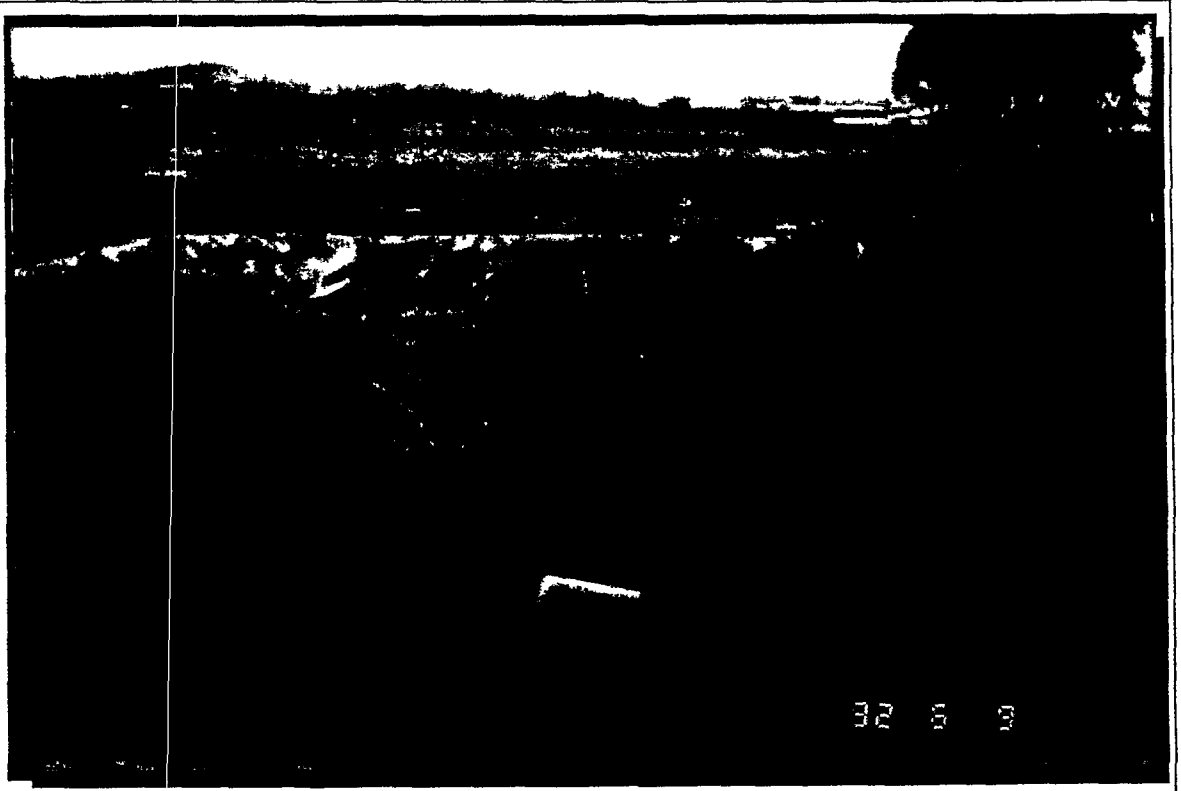
CAD009123456
Stauffer Chemical
1415 S. 47th Street
Richmond, CA

Photo No: 3
Date: 6/9/92
Time: 15:00
Direction: West
Weather: Clear
Photo by: Zwierzycki

Photograph Description: View of evaporation pond 1. Note ICI Americas warehouse facilities in upper right-hand corner of picture. Photo was taken from between evaporation pond 1 and evaporation pond 2.

CAD009123456
Stauffer Chemical
1415 S. 47th Street
Richmond, Ca

Photo No: 4
Date: 6/9/92
Time: 15:00
Direction: West
Weather: Clear
Photo by: Zwierzycki



Photograph Description: View of neutralization pond and pipe discharging to the Richmond Publicly Owned Treatment Works (POTW) shown going across the top of the photo. Soil sample S-2 was collected between the neutralization pond (foreground) and POTW discharge pipe. This area is part of the cinder landfill.

URS Consultants
100 California Street, Suite 500
San Francisco, CA 94111

FIELD PHOTOGRAPHY LOG SHEET

CAD009123456
Stauffer Chemical
1415 S. 47th Street
Richmond, Ca

Photo No: 5
Date: 10/26/92
Time: 11:00
Direction: Northeast
Weather: Clear
Photo by: Sam Won

Photograph Description: *Collection of soil sample S-1 and duplicate S-6 Fence in background is the western border of the Stauffer site. Note* discoloration (purplish hue) to the soils The purplish soils correspond to the extent of the cinder landfill and were assumed to be cinder wastes.

CAD009123456
Stauffer Chemical
1415 S. 47th Street
Richmond, Ca

Photo No: 6
Date: 10/26/92
Time: 14:30
Direction: Southeast
Weather: Clear
Photo by: Sam Won

Photograph Description: Collection of sediment sample E-7 from tidal marsh area. Note the bright yellow color of the sample material. Crystalized material is present in the sample media and on the surface of the shown sediments

URS Consultants
100 California Street, Suite 500
San Francisco, CA 94111

FIELD PHOTOGRAPHY LOG SHEET

CAD009123456
Stauffer Chemical
1415 S. 47th Street
Richmond, Ca

Photo No: 7
Date: 10/27/92
Time: 11:00
Direction: West
Weather: Clear
Photo by: Sam Won

Photograph Description: View of hole dug to show discoloration of sediments near sample location E-7. Note hill on far side of tidal marsh, this hill is part of the cinder landfill and the location of two former sedimentation ponds. Sediment sample E-6 was collected near the end of the fence seen in the background of this photograph.

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Photo No: 8
Date: 8/15/92
Time: 8:30
Direction: Northwest
Weather: Clear
Photo by: Zwierzycki

Photograph Description: View of the Northwestern end of the tidal marsh and the cinder landfill. Tanks seen in the background are part of the neutralization system. Note stressed vegetation and redish sediment color near cinder landfill.

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FIELD PHOTOGRAPHY LOG SHEET

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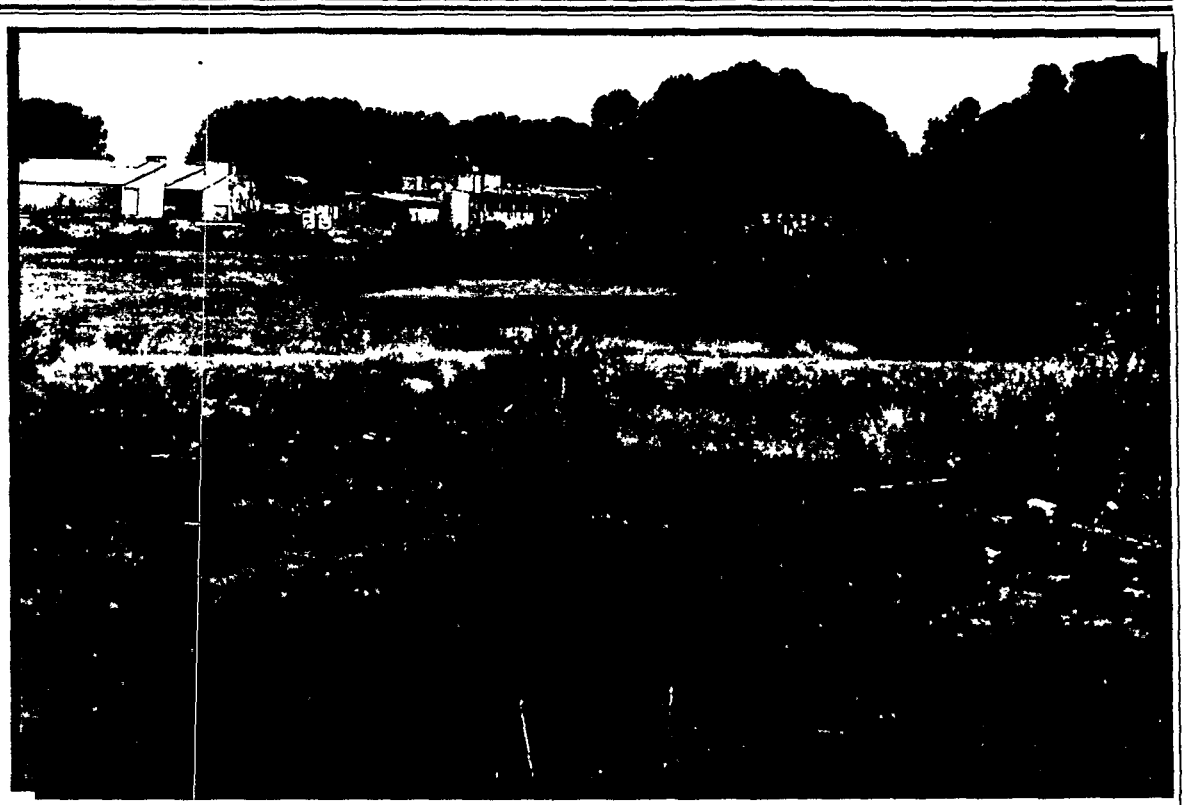
Photo No: 9
Date: 8/15/92
Time: 9:00
Direction: North
Weather: Clear
Photo by: Zwierzycki



Photograph Description: View of a tidal marsh located west of the Stauffer site. The Richmond Field Station is in the background. Sediment samples E-1 and E-2 were collected from this area. Note purplish soils to the right of the photo where the cinder landfill is located.

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Photo No: 10
Date: 9/6/92
Time: 15:30
Direction: South
Weather: Clear
Photo by: Zwierzycki

Photograph Description: View of former outfall from evaporation pond 2 to the adjacent tidal marsh. Sediment sample E-9 was taken from near the end of the fence at this location.

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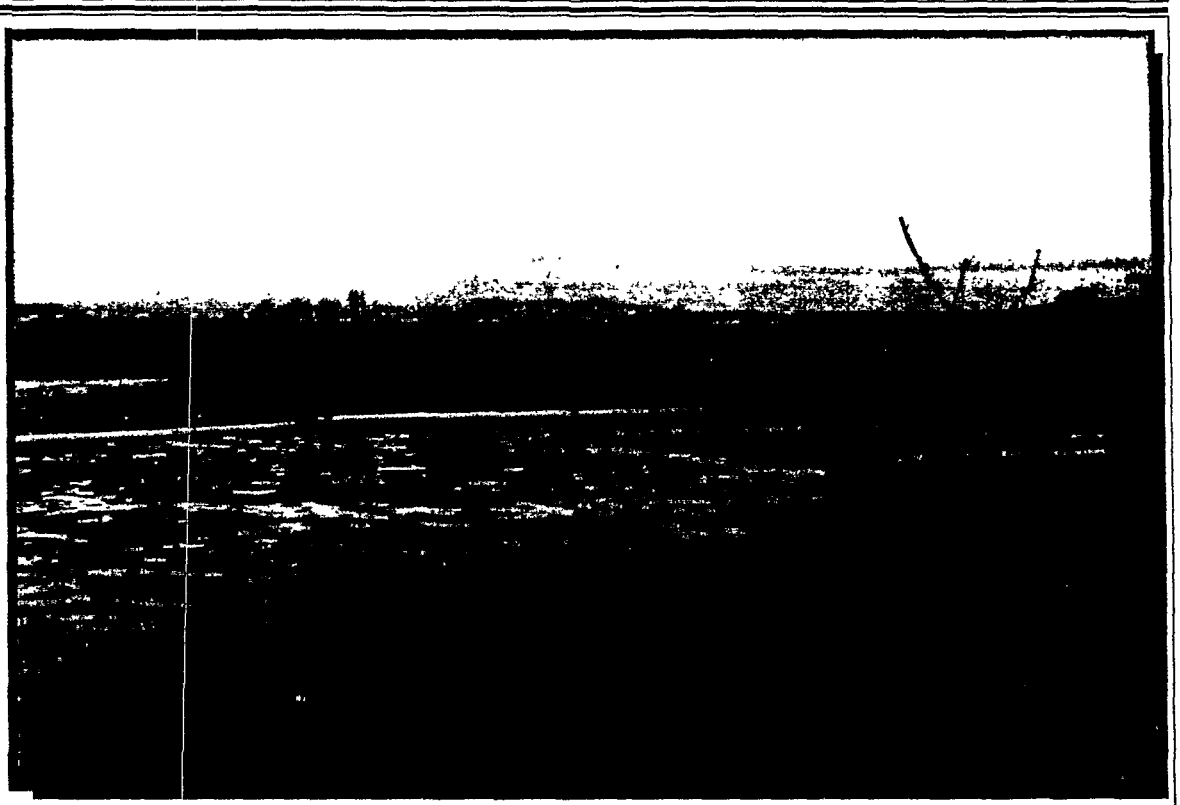
Photo No: **11**
Date: 8/15/92
Time: 9:00
Direction: Southwest
Weather: Clear
Photo by: Zwierycki



Photograph Description: View of San Francisco Bay taken from the "Bay Trail" just south of the unnamed tidal marsh.

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Richmond, Ca

Photo No: **12**
Date: 10/27/92
Time: 17:07
Direction: South
Weather: Clear
Photo by: Zwierzycki

Photograph Description: Photograph of Chinook salmon swimming in a slough within the waters of the tidal marsh adjacent to the Stauffer site.

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Photo No: 13
Date: 10/27/92
Time: 16:00
Direction: West
Weather: Clear
Photo by: K. Larsen

Photograph Description: Photograph of people fishing in the vicinity of sediment sample E-12. The tidal marsh is in the background of the photo.

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Photo No: 14
Date: 10/26/92
Time: 14:14
Direction: West
Weather: Clear
Photo by: Zwierzycki

Photograph Description: View of sediment sampling location E-17. E-17 is a reference sample taken from the southern end of Hoffman Marsh. Trees on the left in the background are part of a regional park.